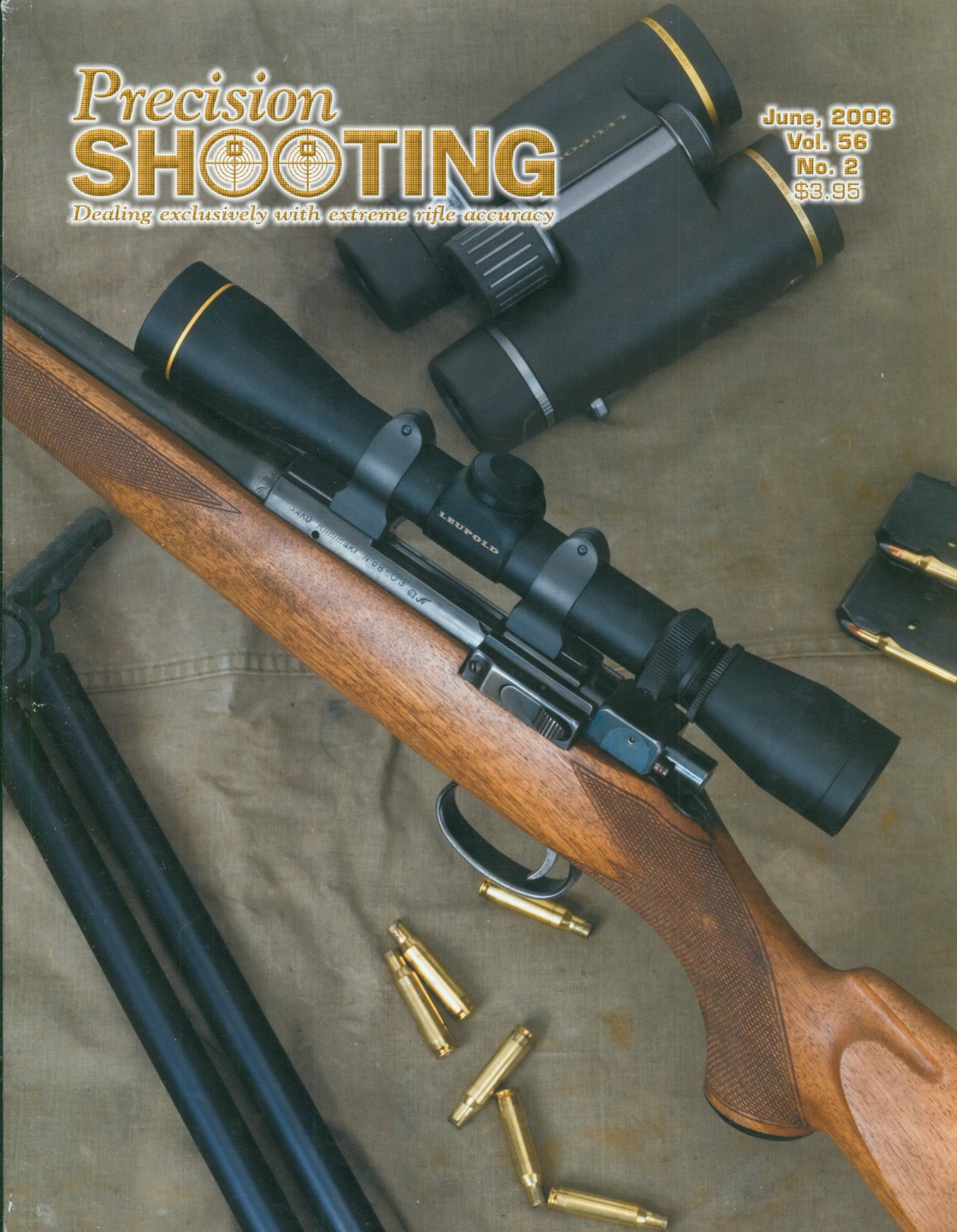

Precision
SHOOTING
Dealing exclusively with extreme rifle accuracy
June, 2008
Vol. 56
No. 2
$3.95
LEUPOLD

KELBLY'S

The Leader in the Benchrest Industry

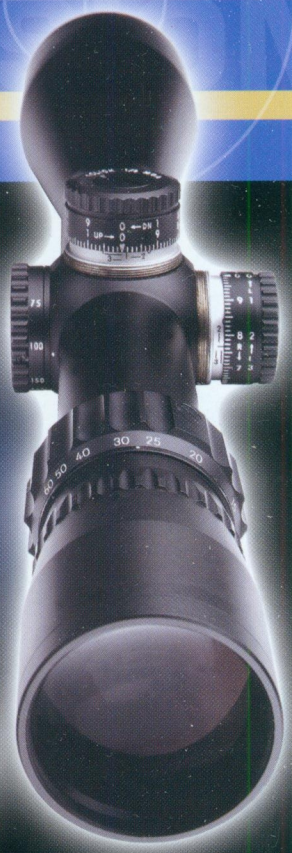
PRECISION BENCHREST TECHNOLOGY

March 10x-60x52mm Variable

- 25.4 ounces in overall weight, 16.45 inches in overall length.
- 1/8 MOA click adjustment with 60 MOA elevation and 40 MOA windage.
- Side focus parallax from 50 yards to infinity.
- Available reticles 1/16 dot, 1/8 dot, Crosshair.

Multi-coated ED lenses that reduce aberration and are designed to provide highest possible image resolution.

Specially designed 30mm erector tube made of high grade aircraft aluminum, special alloy steel and brass used instead of plastic internal components.



330•683•4674

www.kelbly.com

Call Kelbly's for availability of the March 10x-60x Variable or March 40x, 50x and 60x BR scopes

CHAMPION SHOOTERS LIKE Rich DeSimone

TRUST MONTANA X-TREME.

"Whether I'm trying to break my own IBS 1000 yd. light gun world record (1.561" 5 shot group) or bustin' groundhogs with one of my XP-100 wildcat long range pistols. Montana X-Treme products take care of my copper and carbon fouling quickly and easily! Best of all, these products are NOT harmful to the bore. For complete gun care, Montana X-Treme has it all."

— Rich DeSimone, *Current IBS 1000 yard Light Gun world record holder*

MONTANA X-TREME

MADE IN THE USA GUN CARE PRODUCTS

Western Powders, Inc. **800-278-4129** www.montanaxtreme.com

EDITORIAL

If you are lucky enough to have lived in Paris as a young man, then wherever you go for the rest of your life, it stays with you. For Paris is a moveable feast.

Ernest Hemingway (1899-1961)

In the April issue we ran a full page discourse entitled "Highpower Writer Wanted," brought upon us when our main highpower writer sort of retired and our other highpower writer apparently retreated to a mountaintop somewhere (possibly Brooklyn, although Staten Island has also been mentioned as a possibility) to seek the rather elusive *True Meaning of Life*. This has resulted in a few angry letters to the Editor, demanding to know where the highpower articles are as of late. These went into a file on our desktop, placed right next to the file of angry letters to the Editor, demanding to know where the benchrest articles are of late.

Well, we'll take 'em one at a time. Correction: we'll take 'em two at a time. We have since reached agreement with **Dan Arnold** (5205 Deerhurst Drive, Norman, OK 73072 (405) 206-9935) to serve as our main Highpower correspondent. For a little bit of background: Dan is a High Master, Distinguished Rifleman, President's 100, AR shooter since 1994 and he has spent some time with the Small Arms Readiness Group at Fort Hood and Fort Bliss doing pre-deployment Squad Designated Marksman training. He will be running the Mid Range Regional at the Oklahoma City Gun Club on April 12th and 13th and then has a schedule of: May 2nd-4th Panola County Gun Club regional and leg match at Carthage, TX. Followed by: June 13th-15th Oklahoma City Gun Club regional and leg match, June 21st-22nd; July 25th, Leg match at Milan, IL on the way to Camp Perry and then July 28th-August 2nd at Camp Perry: President's Match, Leg, Hearst Doubles, NTI, NTIT, Springfield Match and John Garand Match.

There is of course always the possibility that Dan Arnold will collapse from overwork (or laughter) and we will once again have no Highpower columnist. In order to forestall panic once again spreading like wildfire, we have also appointed **Konrad Powers** (1114 Buckingham Drive, Carol Stream, IL 60188 (630) 267-0069) as an official something-or-other here at **PS**. Konrad has been a highpower shooter for the last ten years and has been at the Camp Perry scene for each of those ten years. Since 2001 he has participated in both the CMP Trophy Matches as well as the NRA Highpower Championships. He currently serves as the Chairman of the Highpower Rifle Committee for the Illinois State Rifle Association.

Both of these individuals have previously appeared in the pages of **PS**. Both have displayed an ability to get along with the Editor without any need for "Pistols at dawn... choose your seconds" type of ultimatums. Both have shown an ability to get a noun in front of a verb and have not left participles hanging all over the page. Neither displays a tendency to use any more foul language than is absolutely necessary to make a particular point in the dialogue. Neither regards himself as the Living Reincarnation of either H.L. Mencken, Oscar Wilde or Pliny the Elder (although making it clear to me that they felt that they could out-shoot any or all of those three worthies.)

That having been said (rather clearly, I thought) I guess it's time to move on to looking for a couple more benchrest-oriented writers because we've been catching merry Hades lately about the lack of benchrest articles in our pages as of late. This is a constant problem in Industry as well...sometimes workers just up and retire...and forget to tell management of their decision in this area. Eventually someone notices that old Whatshisname has not put in an appearance at the plant for a couple of months now and neither has anyone noticed his name in the Obituary pages either. Sometimes they just reappear many months later and behave as if a 12-18 month absence was not worthy of comment. Other times they are just never seen or heard from again. To look at the bright side of all this...it helps to keep the expenses of retirement parties down to manageable levels.

If you are a benchrest shooter who is somewhat active on the benchrest match circuit (and if the price of gasoline continues to go up the benchrest circuit and the highpower circuit may shortly be replaced by the benchrest and highpower Postal Leagues) who

Continued on page 5

PRECISION SHOOTING STAFF

CHAOS-IN-GENERAL

DAVE BRENNAN - Editor

222 MCKEE STREET
MANCHESTER, CT 06040
PHONE (860) 645-8776
FAX (860) 643-8215

ORDER-IN-CHAOS

KIM WOBLE - Advertising Mgr. & Office Mgr.

222 MCKEE STREET
MANCHESTER, CT 06040
PHONE (860) 645-8776
FAX (860) 643-8215

PRECISION SHOOTING COLUMNISTS

R.W. BALLOU
P.O. BOX 30
W. DUMMERSTON, VT 05357

FRED BARKER
14155 WEST 21ST PLACE
GOLDEN, CO 80401
303-277-1244
effbarker@aol.com

ROY BAUMGARDNER
262 SWARTZ ROAD
AKRON, OH 44319
330-773-8104

JIM BORDEN
RR 1, BOX 250 BC
SPRINGVILLE, PA 18844
570-965-2505

GENE BROWN
BOX 1668
SANDPOINT, ID 83864

BILL CALFEE
(SOMEWHERE WEST OF HERE)

NORM & ROCKY CHANDLER
IRON BRIGADE ARMORY
100 RADCLIFFE CIRCLE
JACKSONVILLE, NC 28546
(910) 455-3834

JEFFREY G. CHOSID
1510 PAGE INDUSTRIAL BLVD.
ST. LOUIS, MO 63132
314-824-0001

RANDOLPH CONSTANTINE
LOST AXE RANCH
47951 US HWY 160
BAYFIELD, CO 81122
970-884-4341

JOHN DUSTIN
550 PINE RIVER RANCH CIRCLE
BAYFIELD, CO 81122
(970) 884-0393

JOHN FEAMSTER
P.O. BOX 52408
FORT BENNING, GA 31995

JAKE GOTTFREDSON
4422 WEISKOPF LANE
CORPUS CHRISTI, TX 78413

BOB GREENLEAF
243 HOLYOKE ROAD
WESTFIELD, MA 01085
(413) 568-0787

BILL HEADRICK
2550 ALLENDALE DRIVE
CAPE GIRARDEAU, MO 63701

NORMAN JOHNSON
N2162-80TH STREET
PLUM CITY, WI 54761-8622
(715) 647-2539

BOB JOURDAN
385 FENWAY PLACE
BARTLESVILLE, OK 74006
918-333-5276

HOKE KERNS
190 MOUNTAIN TERRACE LN.
WETUMPKA, AL 36093
(334) 514-5848

JOHN LAKE
101 AVERY PLACE
WEST CHESTER, PA 19382
(610) 793-3768

WES LEFLER
P.O. BOX 775
CONCORD, NC 28026
(704) 782-8033

ROBB LUCAS
1823 N. WAWAUSHNOSH AVE.
MANISTIQUE, MI 49854
(906) 341-3764

DON LEWIS
R.D. #3, BOX 197
KITTANNING, PA 16201
(724) 548-2710

J. PAUL McFADDEN
1812 S. VIRGINIA
AMARILLO, TX 79102

M.L. McPHERSON
10725 ROAD 24.4 LOOP
CORTEZ, CO 81321
970-564-0500

JAMES MOCK
225 FRANKLIN STREET
WINNSBORO, LA 71295
(318) 435-9291

J.C. MUNNELL
633 LONG RUN ROAD
MCKEESPORT, PA 15132
(412) 751-2770 (DAYS)

RICHARD NICOL
1414 N.W. 62ND STREET
SEATTLE, WA 98107
206-784-1093

PAUL NORDQUIST
P.O. BOX 7233
ALEXANDRIA, VA 22307

ROLAND PAOLUCCI
1934 HIGHBRIDGE ROAD
CUYAHOGA FALLS, OH 44223
(330) 923-1978

MICHAEL PETROV
923 WEST 74TH AVE.
ANCHORAGE, AK 99518
907-522-4628
mjpetrov@acsalaska.net

HAP ROCKETTO
18 STENTON AVENUE
WESTERLY, RI 02891

JOE ROXBY
46 LYNWOOD AVE.
WHEELING, WV 26003

JACK RUSH
VIDA, MONTANA 59274

GERMAN A. SALAZAR
2939 W. PLUM HOLLOW DR.
ANTHEM, AZ 85086
(623) 551-6601 (W)

GEORGE C. STEPHENS
1617 N. PATRICK HENRY DR.
ARLINGTON, VA 22205
(703) 533-2180

JERRY STORDAHL
1272 270TH AVENUE
HALSTAD, MN 56548-9471

TOM TATE
3432 WILSON AVENUE
OREFIELD, PA 18069

JOHN D. TAYLOR
15440 POMPEII SQUARE
COLORADO SPRINGS, CO 80921

ROY L. TOWERS JR.
3069 HORSESHOE COURT
HAYWARD, CA 94541
rpatowers@comcast.net

ROBERT C. WHITLEY III
199 NORTH BROAD STREET
DOYLESTOWN, PA 18901
(215) 345-4181 (W)

EDD WOSLUM (PUNGUBWE)
P.O. BOX 154
WHITE BIRD, ID 83554
(208) 983-9208

DICK WRIGHT
9421 E. MANNSIDING RD.
CLARE, MICHIGAN 48617
989-386-3932

Precision SHOOTING®

PUBLISHED MONTHLY BY PRECISION SHOOTING, INC.

EDITORIAL/BUSINESS OFFICE

Editor - Dave Brennan
Advertising Mgr. & Office Mgr. - Kim Woble
222 McKee Street, Manchester, CT 06040
Tel. (860) 645-8776 • Fax (860) 643-8215
www.precisionshooting.com

President - Dr. Richard Maretzo
Vice-President - Jim Borden
Secretary - Allie Euber

Copyright 2007 Precision Shooting, Inc.
All Rights Reserved

Precision Shooting (USPS 441840) (ISSN 0048-5144) is published monthly by Precision Shooting, Inc. Rates: U.S. $37.00 one year, $70.00 two years. Europe - $70.00; Australia; New Zealand - $75.00; Canada - $62.00; Mexico, S. America, Japan - $75.00; S. Africa, Israel - $75.00.

POSTMASTER: Send all address changes to: Precision Shooting, Inc., 222 McKee Street, Manchester, Connecticut 06040.

PLACE OF PUBLICATION: Cummings Printing Company, 4 Peters Brook Drive, Hooksett, NH 03106-6495.

BACK ISSUES are available from Manchester, CT office. A back-issue availability list will be provided at no charge; call or write.

CHANGE OF ADDRESS: We must be notified 30 days in advance of a change of address in order to give you uninterrupted service. The Post office does not forward Periodical mail, and we decline to replace without charge lost issues due to moving.

LOST ISSUES: Other than change of address related. We will not replace more than two issues lost in the mail. Your notice to us of issues lost in the mails should be on a timely basis – I.E., within 60 days of publication, not a year later.

NOTICE TO ADVERTISERS: Rate cards and terms will be mailed to Advertisers on request. We reserve the right to reject advertising that we do not deem in the best interests of Precision Shooting, or which the Editor takes a dislike to.

LOADING NOTICE: The publisher, staff, and contributors to these pages respectfully advise readers that they make no representation of safety for the loads, procedures, or methods reported herein. We publish facts that were used on a given day, under a set of circumstances that are subject to dozens of variables, any one of which may cause an accident if changed or even duplicated. Please use caution at all times in the shooting sports.

Editorial

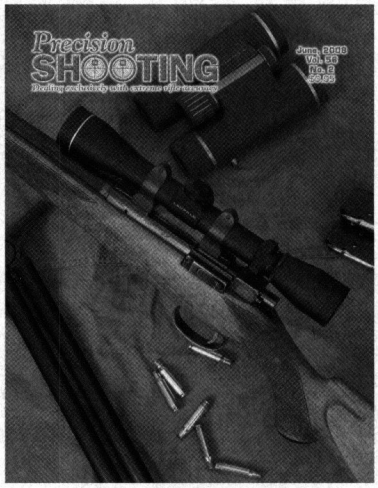
Continued from page 3

has a certain facility with the Mother Tongue and you would like to try a bit of writing for our pages…kindly drop a line to the Editor. No need to be timid…I mean, what's the worse that can happen? Other than our setting the dog on you, of course…

When passed among several people who shoot .44 Magnum and .480 Ruger revolvers for fun, the response was invariably "Those five shots were enough, thanks." I didn't even try to shoot a 50 shot qualification with it. Unloaded weight is 12.0 ounces.

Noted Handgun writer Massad Ayoob writing about the fun to be had with the S&W Model 340 Scandium .357 Magnum.

ABOUT THE COVER



Sako L46 .222, a lightweight varmint rig.

Sako rifles marked Riihimaki have always been prized for excellent accuracy and reliable function. Made in Riihimaki, Finland and imported into the USA in the very early 1950's the L46 actioned rifles had some ugly duckling characteristics such as the stamped bottom metal, box-like bolt sleeve and over-size bolt stop housing.

This one shows its fifty years as thin bluing and stock finish. Never the less, it shoots consistent 100 yard groups that are closer to 1/2 inch than 1 inch with factory .222 ammo. With a brand new Leupold 2x7x33 it weighs just 6 pounds, 11 ounces and makes an excellent "on foot" varmint rig for local Montana gophers. A GI poncho-tarp, shooting sticks, 10x binos and a couple of magazines round out the gear.

Cover photo and About the Cover by Steven Dodd Hughes.

HISTORIC RIFLE RANGE FOR SALE

The benchrest rifle range at Wapwallopen, PA has long been considered the crown jewel of the IBS circuit ranges. Nestled on a mountainside in the Nescopeck Mountains of Eastern Pennsylvania it is easy enough to get to; it's a mere ten miles or so from the intersection of the major East-West highway (I-80) and the major North-South highway (I-81) of the Keystone State. Originally it was the creation of the late Bob Hart (**PS** advertiser, R. W. Hart & Son) and was known as the Council Cup Range. Ownership passed to Dr. Lou Palmisano (of PPC cartridge fame) and was renamed as the John Palmisano Memorial Range.

Up until roughly two years ago benchrest matches were still a regular occurrence at the range. The property has however been maintained in excellent condition since Dr. Palmisano has continued to live on the range as he has done for a number of years now.

The range, with breath-taking mountainside scenery virtually on all sides, has 72 acres of land and a 52 bench covered firing line, with target lines at 100 and 200 yards. In addition to the main house there is the clubhouse, and a trailer with full bathing facilities. There would seem to be an opportunity to broaden the shooting facilities to include other shooting disciplines as well as benchrest. There is also a shale pit on the property which provides supplemental income from developers and contractors of the region.

Interested parties should contact: Dr. Lou Palmisano, P.O. Box 188, RR 1, Wapwallopen, PA 18660.

LAPUA BRASS

220 Russian, weighed (+/- .2Gr.).. $ 75 / 100
22PPC (short): totally prepared .... $199 / 100
6PPC: totally prepared ..... $175 / 100
22BR: totally prepared ..... $190 / 100
6BR: totally prepared ..... $165 / 100
30BR: totally prepared ..... $199 / 100
W-W brass: 30x47 ..... $175 / 100

Hoehn Sales, Inc.
2045 Kohn Rd., Wright City, MO 63390
(636) 745-8144 Ron@hoehnsales.com

The Dominion of Canada Rifle Association

Connaught Ranges
45 Shirley Blvd.
Ottawa, Ontario, K2K 2W6
Canada
Phone: 613-829-8281
FAX: 613-829-0099
Email: office@dcra.ca
http://www.dcra.ca

126th Canadian Fullbore Rifle Championships
15th - 23rd August

and

Long Range 900M Shooting Tournament
F Class & TR
25th - 27th August

For full information and entry forms, contact the DCRA

PRECISION SHOOTING TABLE OF CONTENTS

JUNE, 2008

EDITORIAL 3

LONG RANGE BEGINNINGS, PART 2 *by Steve Adelmann* 7

THE 6MM AT LONG RANGE *by James Mock* 14

ONE SPECIAL MARLIN *by M.L. McPherson* 24

GOOD NEWS FOR COOPER OWNERS
by Roland Paolucci 32

TORQUE TAMER *by Scott Fletcher* 36

CARTRIDGES WORTH WATCHING *by Don Lewis* 51

UNDERSTANDING THE BULLET'S FLIGHT THROUGH CROSSWINDS, PART 1 *by James A. Boatright* 56

THE LAST POST – SACAJAWEA
by Marcia Booth Murdock 67

A MATCH PRIMER STUDY IN THE 6BR CARTRIDGE
by German A. Salazar 80

NIEDNER MODEL 1924 RIFLE *by Michael Petrov* 90

IT WORKED FOR JOE *by Hoke Kerns* 95

A DUFFER'S ODYSSEY *by George C. Stephens* 98

THE TRADING POST 104

IBS NEWS 106

Long Range Beginnings

Part II

BY STEVE ADELMANN

As I recounted in Part 1 of this series, learning to shoot sniper rifles out to 2000 meters exposed just how much I'd never learned about shooting. Besides highlighting my poor math and science skills, the long range classroom imparted useful lessons about different guns, cartridges and other equipment. My R&D efforts have always resulted in more questions created than answered, so I'm far from being one to write a "How To..." on this subject. What I can offer is more feedback about some of the specialized equipment necessary in this pursuit. Over the years I've dealt with a few companies that don't appreciate constructive criticism about their products. So in the interest of brevity and ultrasensitive personalities I'll keep this installment relative to items I tested or employed that actually worked. This brand of marksmanship is a "Shooter Beware" prospect. There are cartridges and guns falsely advertised and demonstrated as *the* long range solution. You can trust that despite much hard work by very talented professionals, no one has found the "Holy Grail" at 2 kilometers yet. Anyone that claims otherwise probably has a healthy supply of snake-oil gun lube they'll throw in to sweeten the deal.

It's been my experience that the most controversial subject in long range shooting is that of the right cartridge. The real answer is there's not one perfect caliber or load. There are both good prospects that deliver and dismal failures that succeed in advertising only. The good news is that folks pursuing the elusive "One Mile Shot" have several choices. It's likely that more options will emerge as time and technology progress. When I got involved in this endeavor several years ago, I had only the .338 Lapua Magnum (LM), .408 CheyTac® and the already fielded .300 Win Mag (WM) and .50 BMG sniper systems to work with. Of those, .338 LM and .408 advertised the most promise but offered the fewest options at that time.

Continued on next page

Photo 1: Remington's M24A3-AI, chambered in .338 LM and pictured here with Accuracy International stock, Harris Bipod, Leupold M4 3.5-10x, and OPS INC 3rd Model thread-on sound suppressor. Remington's entry into the .338 LM race is a good sign for consumers on this side of the Atlantic.

Long Range Beginnings, Part II

Continued

TRIED AND TRUE

While not likely to win the long range crown, .300 WM is worth discussing as a natural starting point. It's a favorite among snipers blessed with access to it, and for good reason. The traditional tactical load allows match grade 190 gr. Sierra MK projectiles with BCs in the .588 range to reach muzzle velocities (MV) around 3000 fps. The result is flatter trajectory, shorter flight time and decreased wind effects when compared to the conventional .308 Win. At standard atmospherics (59° F, 78% humidity, 29.53 in Hg) with a MV of 2950 fps, these projectiles decelerate to the speed of sound (1117 fps at this temp) around 1375m. This load is phenomenally accurate out to 1000m with operational evidence of it far exceeding that range in the right hands and platform. Despite many years of experience shooting issued .300 WM rifles, I wasn't savvy enough to put more R&D effort into giving this cartridge longer legs. Fortunately there are professionals currently doing good work in this arena with heavier projectiles and different barrel configurations. The US Army would do well converting the soon-to-be mothballed M24A1 into Remington Arms' .300 WM, M24E (Enhanced) configuration. Not only would this re-chambering extend the Army sniper's effective range to 1000+ meters, Remington's external box magazine conversion would be a welcome addition to the system. Though there's a practical limit to this cartridge's effective distance, overall it's solid for sniping and further development may bring renewed interest in employing it "out yonder".

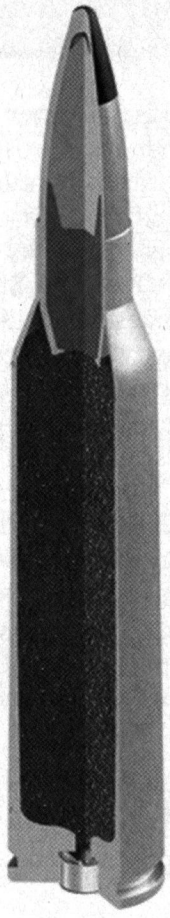


Photo 2: This cutaway of RUAG's .338 LM Armor Piercing munition shows the 260 gr. projectile, complete with tungsten-carbide penetrator. With a BC in the .635 range, excellent geometry and weight distribution, this projectile is very accurate and out-performs many "match" projectiles as a general purpose, long range round.

My last article provided an abbreviated history of the .338 LM. This cartridge has emerged as the favorite among tactical shooters eager to move into the 1500m (+) neighborhood. Availability of factory loads is rising steadily, handloaders have access to quality brass and high BC projectiles run the gamut from 250 to 300 grains. This magnum requires use of a long action (LA) and there's some debate in the industry as to whether or not it's safe to convert LA rifles to .338 LM. I'm not technically adept enough to weigh in but I've noticed most manufacturers are building receivers specifically for this size cartridge. One problem that has plagued some .338 LM shooters – and I learned the hard way – is not all .338 LM cartridges are alike. For reasons I'll never understand, two different overall lengths (OAL) are available. I only know of one manufacturer requiring the shorter OAL: Accuracy International. I can vouch for AI's reputation for phenomenal durability and accuracy in smaller calibers. But their .338 LM rifles suffer from magazines too short for the longer dimension. Last year SAAMI followed the CIP specification for an OAL of 93.5mm or 3.681", which is the longer load. Overall this should be positive due to more powder capacity and projectiles being seated closer to the rifling. Some factory loads are available in either length so it pays to know which fits in your rifle. Fortunately most new .338 LM rifles are designed for the SAAMI specified OAL. These guns will generally feed the shorter .338 LM loads reliably but accuracy may suffer due to the increased jump to lands and grooves. At a minimum, potential muzzle velocity suffers due to lighter load possibilities. Instead of confusing readers with different measurements, suffice it to say you need only focus on the SAAMI number. I've heard explanations from representatives in both the firearms and ammunition industries as to why the shorter length was created but I haven't heard what advantage it provides. I suspect the wonders of the free market will correct this problem in the long run. I've heard from the ammunition industry that AI is presently developing a remedy for their guns, but as of this writing have no direct confirmation from them.

In terms of verifiable performance, the .338 LM shows itself to be an accurate long range system with sub MOA capabilities between 1000 and 2000m. Because its action is significantly smaller than those in the .40 to .50 range, rifles are accordingly more compact and lighter. Best of all, the choices in .338 LM firing platform are on a near-meteoric rise. Prices range from the mid $2K range all the way up to $8K+ for rifles alone. One new example is Remington's M24A3 seen in *Photo 1*. This version of the venerable M24 system is built on a new action, complete with external magazine. This is just one example of several new developments on the market today. On the ammunition front, Ruag's diverse line of Swiss P sniper munitions offer matching close-range trajectories within a caliber and proven long range accuracy. The armor piercing (AP) cutaway in *Photo 2* is one example with excellent performance. This load shot better for me at 1500m than several manufacturers' conventional match loads.

SUCCESSFUL SIGHTINGS

There's no doubt any great rifle/cartridge combination can be hamstrung by poor ancillary equipment, particularly the riflescope. To find out if your favorite optic is up to the task, simply thrust it into the long range crucible. There's no better place to expose poor design, inferior lenses, reticle shortcomings or structural weakness. Here again price is not always concurrent with quality and capability. I've been stuck on a deployment with a $2300 scope whose sole strength was the manufacturer's claim it could survive being driven over by a truck. I'm pretty sure that's the dumbest advertising gimmick I've ever seen associated with precision shooting equipment. I've also used tactical optics in the $800 to $1200 range worth twice that amount when compared to their competition. Needless to say it pays to shop around and ask questions of people with practical experience in this arena.

A scope's design dictates its ability to support long range shots. At distances beyond 1000m, any limit to elevation adjustment becomes a serious problem for someone dialing in corrections. One method is to use sloped scope bases or rings, normally with 20 to 40 MOA built in. An un-sloped optic with 65 MOA total elevation adjustment doesn't leave all that travel available for come-ups after zeroing. A sloped mount places the scope's erector assembly at a point where more elevation adjustment remains usable once sighted in. Lacking this, if a shooter intends to dial in elevation using a ballistic drop compensating (BDC) or target knob, elevation will hit the upper limit prior to maximizing capabilities of the rifle, cartridge and [hopefully] shooter. Before I discovered sloped rings I tried to outsmart my optics by using 500m or 1000m zeros. I thought this would provide the extra adjustment needed, with vertical stadia marks permitting hold-under points for closer ranges. I found the reality is that any distance bought on the far end isn't worth the near end trade-off. For example, when shooting Lapua's 250 gr. Scenar at 2950 fps with a 65 MOA scope, a 100m zero runs out of elevation at 1300m – *and that's assuming you have all 65 MOA available after zeroing*, which you won't. Using a 500m zero, the upper limit is only 1450m. A 1000m zero allows maximum adjustment to 1675m, but you have to factor in a 100m target now requires dialing *down* 40 MOA to engage. If you're in this situation go straight to a sloped base or ring set to conserve time and to limit the need for expletives. Several new, high quality optics provide internal adjustments of 100 MOA or more, so this problem may become less significant for die-hard BDC fans.

A better option for long range "dope management" is to use reticle holds. While I'm not a fan of purpose-built reticles calibrated for one gun and load, there are folks that still swear by them. If you plan to shoot one rifle, with a specific, repeatable load in the same atmospheric conditions 100% of the time, a custom reticle might actually provide you requisite accuracy. But if you're like 99% of the shooters requiring accurate shots past 500m, this option won't work for you. Back when my body moved faster than my brain, I preferred purpose-built reticles because they're so easy to use. The fact that I'm inherently lazy probably had something to do with it too. However I've since learned that when engaged in serious pursuits, the flipside of "Easy-To-Use" is usually "Not-Worth-A-Damn." For military weapons such as crew-served and short range carbines, custom reticles can be handy

Continued on next page

GRE-TAN RIFLES GTR (970) 353-6176
29742 W.C.R. 50
KERSEY, CO 80644
Action Truing ✧ Rebore Bolt Raceway
Bolt Body Sleeves ✧ Rebarrel & Chambering
Bedding Systems ✧ Piloted 17-19-20 Cal Reamers
*Tooling Catalog for Gunsmithing
*Gun Shop Catalog for Services
*Videos on Gunsmithing
IBS & NBRSA 1000 yard World Records
Fax: (970) 356-5940 www.gtrtooling.com

Long Range Beginnings, Part II

Continued

because they take little thought and anyone can use the holds without knowing gun-specific data. However accuracy suffers anytime the weapon system is fired in conditions other than those the reticle holds were calibrated for. Barrel wear and lack of ammunition consistency also play havoc on accuracy, so it's hard to envision where a purpose-built reticle makes sense when precision is called for.

The best reticle hold option for elevation, windage and moving targets is with detailed mil reticles subtending from .5 mil down to .2 mil. In general, the more detailed the reticle the more accurate all measurements incorporating mils will be. An easy way to understand this is to compare these reticles to a ruler. If you measure something with a ruler marked only in inches, you'll have to estimate any measurement that falls between markings. But if you add markings every 1/8" your measurement will be accurate within to that 1/8". The same is true for mils and can be seen in the accompanying images of basic mil-dot (*Photo 3*) and Horus Vision H37 (*Photo 4*) reticles. Though complex at first sight, the Horus reticle provides tremendous functionality for long range target engagement. It has 41 mils below center, and the reticle's stadia intersection is actually 4 mils above center, providing more hold-over at max power (in a 1st FP scope). A key advantage beyond the .2 mil subtension is that wind holds and moving target leads at any distance are easily handled by use of mil markings left and right of the center stadia. A standard mil-dot reticle requires a shooter using mil holds to guess for winds or leads and in this game, guesses tend to beget misses.

If the current rage for huge objectives and ultra-high power scopes were any indication, I'd guess everyone in the US is trying to shoot deer in a neighboring county. Long range shooting is one of the few places where 50 to 56mm objectives and 20x scopes are actually warranted in the field. However, too much power can be counter-productive, particularly in low light or high mirage conditions. Fortunately high quality variable scopes are available that allow dialing down to the 12-20x range, providing better light transmission, fields of view and steadier images. In most cases shooting targets in the neighborhood of 1500m can be handled at 14-16x just fine.

A final comment on optics is that to make full use of a mil reticle, elevation and windage adjustments should be in mils. That doesn't make much sense until you realize 10 clicks on a .1 mil increment turret equal 1 mil of impact shift at 100m. As it turns out, the mil reticle subtends very well to metric measurements. One milliradian equals 10 centimeters at 100m, making a mil reticle scope with centimeter (.1 mil) adjustments a useful set-up. The reticle allows you to measure exact distance in any direction from point of aim (POA) while zeroing. The .1 mil adjustments allow dialing those measurements exactly as measured with the reticle. I've zeroed rifles with this setup in 2 to 3 rounds on almost every occasion I've used them. Rifle scopes in the US normally have MOA-based adjustments and I suspect I'll get loads of disagreement from most quarters on mil-based clicks, except from shooters who have discovered their true functionality. Don't get me wrong, I don't speak French or pay my bills in Euros. I'm old enough to remember that we were supposed to be on the metric scale by 1976 (I was in 2nd grade). I still think and speak in inches and MOA (except when measuring shooting distances in meters). I've simply realized I'm more effective in precision work when my reticle subtensions match my scope adjustments. With the ul-

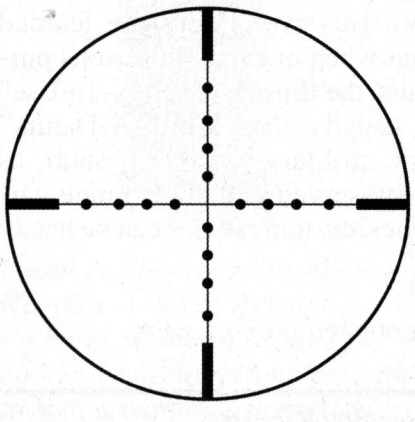


Photo 3: This image of a basic mil-dot reticle shows that although it's far superior to a standard "plex" for hold-over's and leads, it lacks precise measurements beyond the whole milliradian.

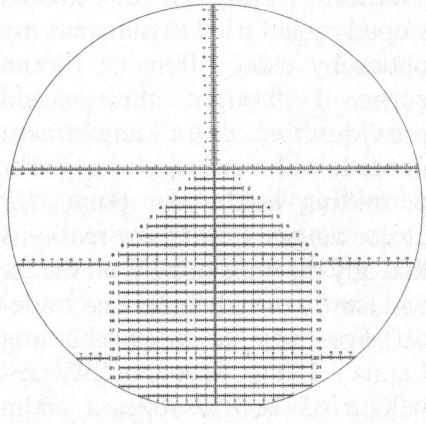


Photo 4: The Horus H37, seen here at approx. 10x, is well suited for any long range application and platform. Ample mils are provided down to .2 mil for hold-overs and wind holds at any distance. Though complex at first sight, the utility of this design becomes apparent when placing shots at extended ranges or dealing with multiple targets at varying distances.

timate utility of the mil reticle, this necessitates clicks in tenths of a mil and now that I understand why, that makes perfect sense. Despite that rationale, I suspect it will be many years before centimeter clicks are a common offering on US-made optics.

ANCILLARY BLISS

Beyond guns, bullets and scopes, several important items can make or break long range precision work. Even the usually overlooked muzzle brake takes on new significance. As with all tactical rifles, a balance must be achieved between braking felt recoil and reducing signature. Unfortunately one need is often sacrificed for the other and a lopsided compromise results. Flash suppression generally trumps muzzle braking on assault rifles, battle rifles and carbines. On larger guns the need to return to target quickly for shot observation and potential follow up gives muzzle braking greater importance. The hard hitting nature of these calibers also necessitates braking to aid accuracy and limit shooter wear and tear. I've spent a lot of time behind one particular brand of .338 LM rifles and found that changing from the company's standard muzzle brake (no more than a machined and ported pipe) to their baffled brake reduced felt recoil to below that of a .300 WM. Performance of the better brake was immediately evident with reduced group sizes and my ability to frequently put in long range sessions. Military snipers are finding that well designed sound suppressors tame muzzle blast, flash and felt recoil. The added sound reduction becomes a secondary benefit in many cases. One drawback is increased overall rifle length, sometimes making it too unwieldy to carry long distance with the suppressor installed. Sound suppressors have additional unique considerations worth weighing, such as zero shift and muzzle interface choices, but overall they provide significant advantages.

Previously I touched on the fact that a good ballistic computer can make nearly every aspect of a sniper's trade more efficient. Even much of the sniper "Old Guard" has embraced their utility. I suspect that like me, once shooters get hands-on time with any of the good programs and devices, their utility becomes apparent. Whether using a hand-held device, laptop or desktop computer, enough information can be gleaned from these applications to greatly enhance chances of a first shot hit. I've worked with many of the current programs and devices available and there are pros and cons to each. Most provide elevation and wind corrections, moving target leads, angle/slope calculations and atmospheric corrections. I've had the greatest laptop/desktop success with Sierra's Infinity and Perry System's Exbal. Both provide detailed information about most commercially available projectiles and allow input of custom bullet data, providing endless functionality. Other important data such as maximum range, point-blank range, bullet path and range calculations can be gleaned (plus much, much more).

For handheld ballistic computers, programs from Horus Vision and Perry Systems are user favorites. Both are Pocket PC compatible, providing portability and convenience at the range or in the field. I have more experience with Horus' A-tragMX, but I know long-gunners just as happy with Exbal. For long range shooting the edge goes to A-tragMX due to an ability to calculate both spin drift and coriolis, which are critical at ranges beyond 1000m. Both programs allow input of multiple ballistic coefficients (BC), which helps to fine-tune the firing solution since BC changes throughout the projectile's flight path must be accounted for.

A final point about ballistic programs is that they are neither replacements for learning to develop data manually nor required to make the shot. Rather they complement the shooter's equipment and speed up the process of developing data for different distances, environments and loads. It's both common practice and recommended to fall back on the tried and true logbook or "dope card" affixed to the rifle, complete with come-ups for the individual shooter, gun and primary load. All electronics fail and many situations don't allow their use in the first place.

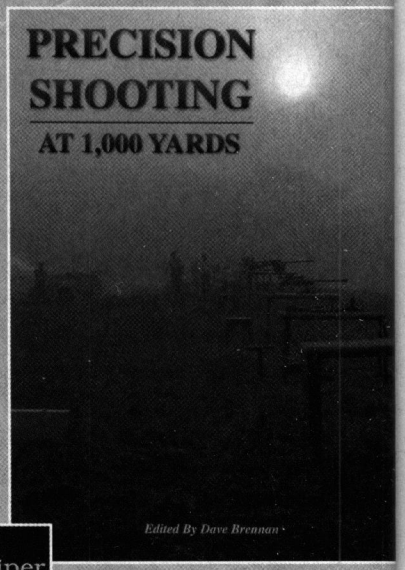
A good quality atmospheric measuring device goes hand in hand with the ballistic computer. The gold standard for tactical shooting is the Kestrel 4000 Pocket Weather Tracker, seen in *Photo 5*. The critical elements needed for inclusion into a ballistic program are ambient temperature, barometric pressure and humidity, often expressed as "TBH". These mini weather stations also provide an anemometer function, measuring wind at the shooter's position. Although experience in a particular environment and a quality thermometer can provide the shooter enough information to get by, having a small, light and element-resistant device like the Kestrel makes quick work of accurate measurements.

Continued on page 13

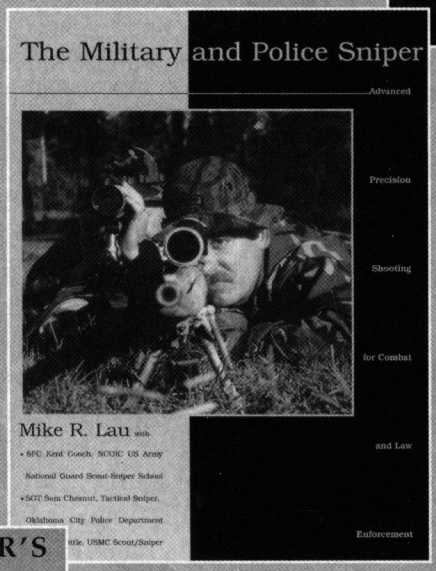
EXBAL
Ballistics Calculator
PERRY–SYSTEMS
www.perry-systems.com
(for top guns - see why)

The Fascination of The Long Shot!

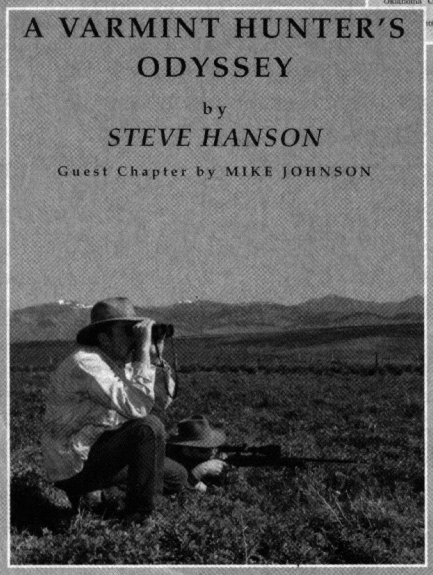
► **Precision Shooting at 1000 Yards.** Thirteen chapters authored by *Precision Shooting* regular contributors... Tom Lintner, Norm and Rocky Chandler, Hap Rocketto, Steve Hanson, Steve Hugel, Ian Cheeseman, Jacob Gottfredson, Randolph Constantine, M. L. McPherson, Larry Bartholome, Dave Scott and John Feamster. Coverage topics include: Highpower, Palma, Military Sniping, live varmint shooting, accuracy gunsmith interviews, Billy Dixon's famed shot at Adobe Walls, F-Class today, 1000 yard benchrest, long range optics, and reloading for 1000 yard shooting. Softcover, 256 full size (8 1/2 x 11) pages. **$34.95**



► **The Military and Police Sniper**, by Mike Lau. Widely regarded as one of the two best books in print on the topic. The lead author, the principal of Texas Brigade Armory, joins with an Army Sniper, a Marine Scout/Sniper and a large city law enforcement sniper to turn out a milestone work on rifle accuracy for professional snipers. Topics covered include (among many others) the Marines' M40A1 rifle, and the Army's M24 rifle, cartridge selection: .308 Winchester, 5.56mm (.223), .338 Lapua, .50 BMG and others, external ballistics, range estimation, uphill and downhill shooting, moving targets, etc. Softcover, 352 full size (8 1/2 x 11) pages. **$35.00**



► **A Varmint Hunter's Odyssey**, by Steve Hanson. Long range varmint shooting always will be equipment-driven. Hanson starts off five consecutive chapters on varmint cartridges with the lower-powered, and works his way up to the big boomers, all with an in-depth review: .22 WMR, .22 Hornet, K-Hornet, .218 Bee, .221 Fireball, .17 CCM, .17-221 Fireball, .17 Mach IV, .17 Remington, .222 Remington, .223 Remington, .222 Remington Magnum, .223 Remington 40° Improved, .222 Remington Magnum 40° Improved, .22 PPC, .22 Remington BR, .225 Winchester, .22-250 Remington, .17BR-VLD, .220 Swift, .22-250 40° Improved, .220 Weatherby Rocket, 6mm Remington, .243 Winchester, .250 Savage, .250 Savage 40° Improved, 7mm-08 Remington, 6mm-284, .22-6mm Remington, 6m Remington 40° Improved, 6.5-284, 6.5, 6.5-06 40° Improved, 7mm STW, .338-416 Rigby 35° Improved. Does for the new millennium what Ackley's *Handbook* did for the last millennium. Softcover, 280 full size (8 1/2 x 11) pages. **$37.95**



ORDER NOW: Prices shown above. **Order from:** Precision Shooting, 222 McKee Street, Manchester, CT 06040. Shipping and Handling in U.S. is $3.50 for first book, $5.00 for multiple books. Foreign orders (including Canada) will be shipped Economy Mail unless Air is requested; both will be charged actual shipping costs plus $1.00 handling. Visa or Master Card orders accepted without surcharge at our CT office (860) 645-8776 phone; (860) 643-8215 fax. CT residents add 6% sales tax; NY residents add 4% sales tax.

Long Range Beginnings, Part II

Continued from page 11

I mentioned in Part I that I learned I could shoot the .338 LM better off the ground, either supported with a bag rest or bipod. The preferred type of rest is as individual as a favorite driver in NASCAR. Some accuracy buffs swear by the bench, others like to isolate their rifle with a vice-like rifle rest and a few oddballs like me are more comfortable lying on the belly. Whatever your preference, a good support can certainly help tighten up groups out at distance. If using a bipod, resist the urge to go big and bulky just for sake of strength. I've seen too many poorly designed bipods hamper the performance of a $5,000.00 rifle that would otherwise turn in excellent accuracy. If shooting in anything other than static range conditions, a good bipod design allows independent adjustment of leg length to accommodate uneven terrain. If you routinely lose skin on your hands each time you adjust those legs, invest in a different bipod. The ability to cant the rifle slightly is also useful to account for small angular corrections, but this adjustment has to have enough tension to prevent a top heavy rifle from flopping around when not on the shoulder. Lastly, the bipod ought to be under some type of spring tension when folded so it doesn't rattle. Whether stalking on a hunt or moving into a tactical position, a noisy bipod is a liability.

Although there's a genuine lack of expertise in the shooting industry about extended range precision work, the landscape is improving. Instructors, military personnel, R&D specialists and industry representatives increase the collective knowledge base daily. If you're planning to get into this shooting genre, your expectations must be reasonable. I mentioned previously that the learning curve is actually straight up and this general knowledge void doesn't make that ride any easier. Additionally, shooting equipment for long range work tends to be expensive. The best you can do to get through the trials and figure out the tricks is to study what really works for other shooters and then experiment for success. At the end of the day a little patience and a lot of hard work will go far towards making your precision shots count, well into the next grid square.

Steve Adelmann is a freelance writer, former Special Operations Sniper and 21 year veteran of the US Army. He owns Rifleman Consulting: teaching and consulting to citizens, the firearms industry and the US government. Go to www.riflemanconsulting.com for more information.

SOURCES

Remington
800-243-9700
www.remington.com

Accuracy International
254-968-3112
www.tacproshootingcenter.com

Ruag
www.ruag.com

Horus Vision
650-583-5471
www.horusvision.com

Sierra Bullets
888-223-3006
www.sierrabullets.com

Perry Systems
www.perry-systems.com

Kestrel
610-447-1555
www.nkhome.com

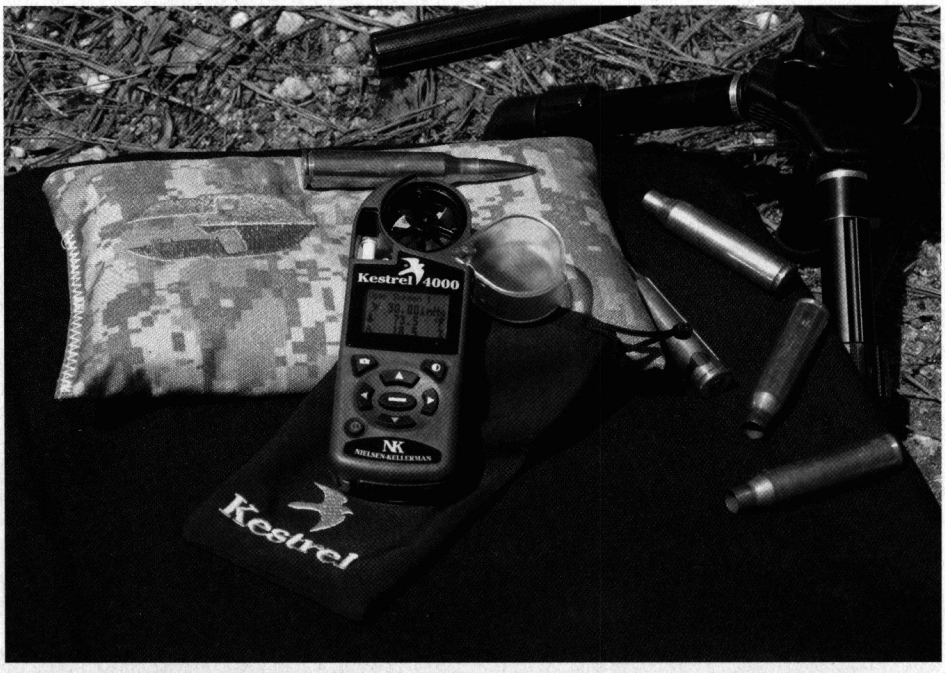
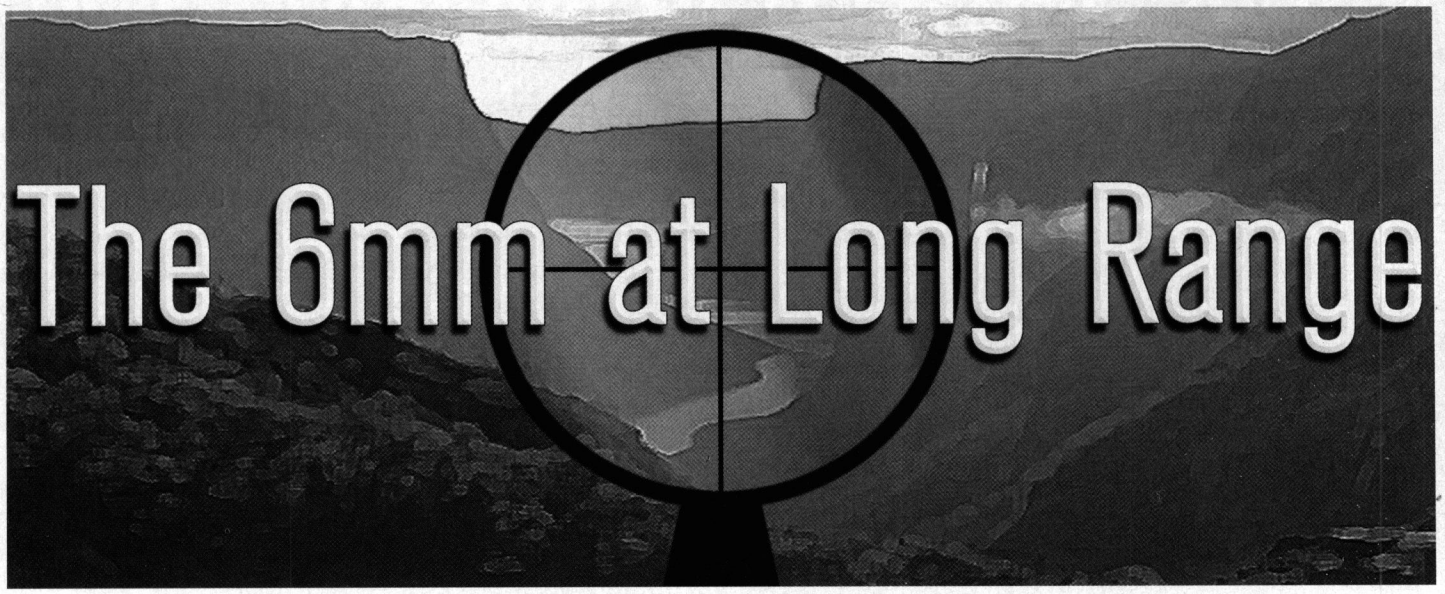


Photo 5: Nielsen-Kellerman's Kestrel 4000 is the hands-down winner for atmospheric measurements used to calculate precise elevation and windage adjustments. Their newer 4500 model (not pictured) includes a digital compass and ability to mount on a weather vane for competitive shooting. Despite years or hard operational use in extreme environments, I've never had one fail.



The 6mm at Long Range

BY JAMES MOCK

Just as the .222 Remington was "King" of short range Benchrest shooting, so was the .30 caliber in the long range games. The .308, the .300 Winchester Magnum, and the .300 Weatherby once ruled the long range events. The .30 caliber has not been replaced, but it does have some competition.

The seven millimeter cartridges were tried and they gave way to the more popular 6.5 millimeter cartridges. The 6.5 is still very popular...especially the 6.5 x .284, but there are some new kids on the block.

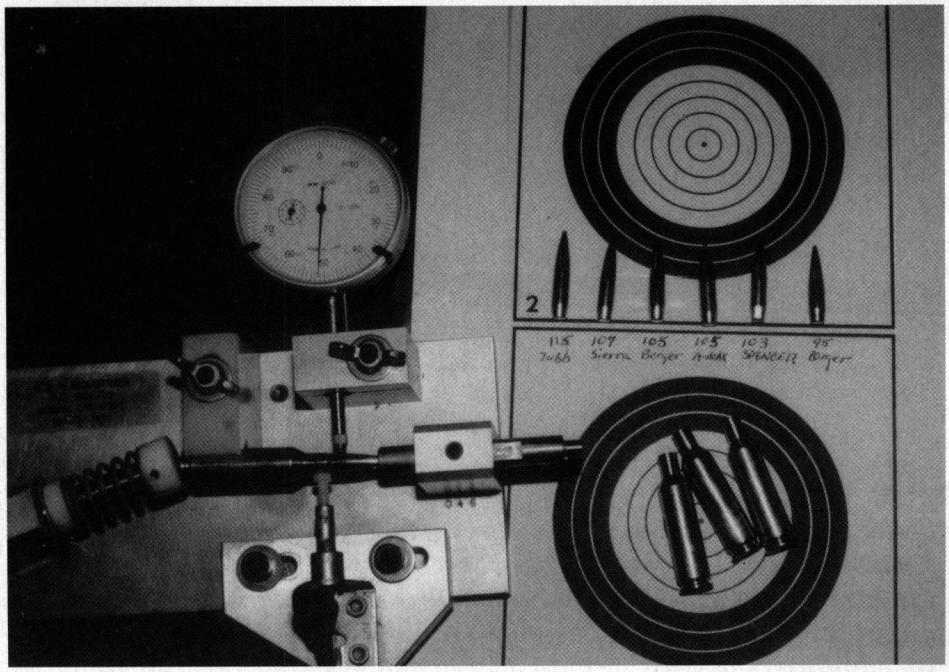
If memory serves me (it seems to serve me less and less each year), a long range shooter shot a 1000 yard group that measured less than two inches in 2001. The amazing thing about this group is that it was shot with a 6mm rifle. I believe that the chambering was a 6mm/06 Improved. **Heresy!**

Why would shooters turn to a cartridge that seems inferior to the tried and true .30's? To answer in one word....**Recoil**.

David Tubb is one of the pioneers that tried the 6mm before it became proven. He is one of the most accomplished long range shooters of all times. I believe that his first efforts with the 6mm was with a .243 Winchester cartridge. He loaded it with a stiff charge and heavy bullets.

After much experimentation, he developed a cartridge called the 6XC. **(See Photo #1)** This cartridge was first made from a blown out .22/.250 with a thirty degree shoulder, but brass from Norma can be bought now. This case is almost identical to the 6mm/6.5x47 Lapua, but Tubb's round uses a large rifle primer rather than the small primer of the Lapua case.

There are many 6mm wildcat cases used today for 300 to 1000 yard shooting. The 6mm Benchrest cartridge is very accurate and is used extensively at 300 yards or 300 meters. To give it more horsepower, it has been lengthened and "improved" in various ways. The 6mm Dasher, the 6BRX and 6BRM are all derivatives of this cartridge. One step up from those are the 6XC, the .240 Coyote, and 6mm Lapua. These three give about 99% of the velocity of a .243 Winchester with less powder and less throat erosion. **(Photo #2**



#1 The 6XC developed by David Tubb.

shows several of these cartridges)

None of the ranges in this neck of the woods host registered Benchrest "group" matches. Therefore, if I wanted to play with the locals at the range, I needed a long range rifle. After considering my needs in this area, I decided to put a new barrel on my old BAT/ Scoville Benchrest rifle. I had considered using the new Savage Target action; but with the cost of the stock, and labor to put it together, I opted for rebarreling the BAT.

After assessing my needs for a long range cartridge, I settled on the 6XC. The 6mm/6.5 Lapua was seriously considered, but I opted for the large rifle primer.

The events in which I plan to participate will all be contested from a benchrest. I will not shoot any F-class or position events that require me to abuse this old body.

Now that I decided on a cartridge, I realized that my trusty BAT has a PPC sized bolt face, and I needed a .308 size. Not wanting to open the bolt face of my rifle (mine has an ejector and it works better with the PPC sized face), I chose to buy another bolt. Bruce Thom and Tom Dickson found one in their inventory with the proper sized bolt face and with left eject. This worked out well for my RB/LP action with a right microport. **(Photo #3 shows rifle, two bolts, and dies from David Tubb)**

A call to Krieger got them started making a 8 twist HV barrel for this project. It finished at 26.5 inches and has a .237 bore/4 grooves. Jerry Simison of Detroit Lakes, MN did the chambering of this rifle. He also was the gunsmith of record for the 2-gun winner at the 600 yard Nationals. His work is superb.

I took the advice of fellow **PS** writer, German Salazar, and ordered a reamer from Dave Kiff with a .271 neck. This diameter will allow me to turn the necks enough to clean them up and still use the two bushings (.266 and .268) that are furnished with the Tubb die set. Let me say that changing calibers is not cheap.

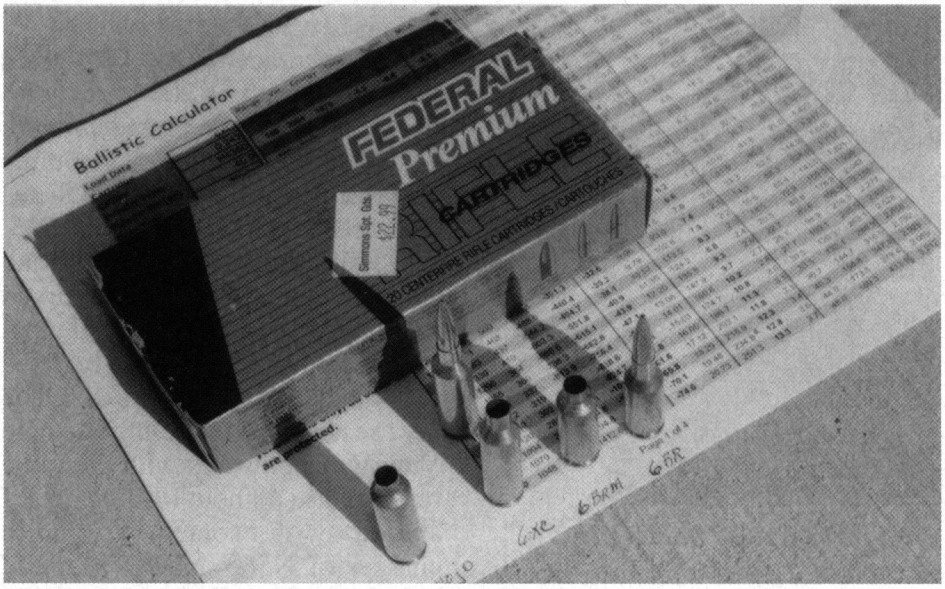
As I write this, it is mid-winter and the rifle is complete. I have shot it some but not yet in competition. Being new to the long range game, I sought advice from friends who had experience. One friend who helps me a great deal is Murry Crowe. **(Photo #4 shows Murry with his favorite rifle...a Panda-actioned/Spencer-barreled 6mm MOJO. This cartridge is similar to the 6XC except the shoulder angle is 40 degrees rather than 30 dgrees.)**

Murry won the F-class State Championship recently with the rifle pictured. Since I have entered his world, I am trying to get him to try his hand at short range benchrest. He may be weakening, but I am not sure.

TESTING THE 6XC

The closest range with 600 yard capability is an hour from my

Continued on next page



#2 Several 6mm cartridges used for long range shooting.

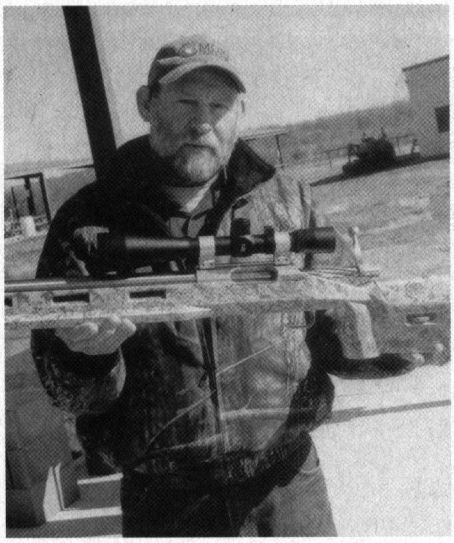
#3 The author's BAT used as a 6PPC and 6XC.

The 6mm At Long Range

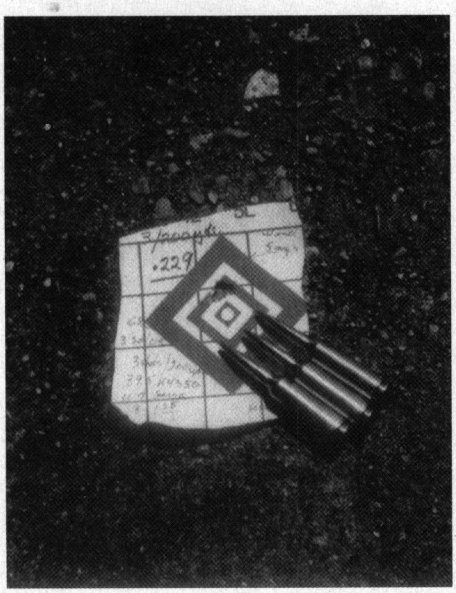
Continued

home, so most of my testing has been at 200 yards. There are many excellent VLD bullets that are available for 6mm cartridges today. I have cartridges from Berger (95 and 105), Sierra (107 and 115), Hornady A-max (105), and Clay Spencer's 103 grain offerings.

For powders, I have tried H4350, H4831SC, V V N550 and N560. I plan to use some Reloder 22 and perhaps Reloder 19.



#4 Murry Crowe holding his Panda in 6MM Mojo.



#5 My best 200 yard group-a .229 inch 3-shot effort.

Loading the 6XC with these coarse powders requires weighing each charge. I normally load the 6PPC directly from the powder measure.

SHOOTING THE 6XC AT SHORT RANGE

Not knowing what accuracy levels to expect, I began my testing at 200 yards. Day one was used to break in the barrel and chronograph some loads. With a 107 grain Sierra loaded into the lands, I tried 42.0 grains of H4831 SC. The chronograph registered velocities from 2834 to 2851 fps. (Too slow!) Forty three grains of the same powder moved the velocity to 2997 (Much better).

The accuracy of the 43.0 grain load was tested at 200 yards with two bullets. The results were somewhat disappointing. The three shot groups with the 107 Sierra measured **.667, 1.115, and .905**. The 105 grain Hornady A-Max showed a lot of vertical and turned in groups of **1.465, 1.545 and .681**.

After this first session, I realized that I had some work to do. The next session found me trying some VihtaVuori powders with the same two bullets. Without loading data, I started with some very mild charges of N560 and N550. I did not chronograph these loads, but the 107 Sierra ahead of 38.5 grains of N560 gave groups of **1.171, .552, and .796** at 200 yards.

The same charge with the 106 A-Max shot **.285 at 100 yards and 1.134 at 200**. The results so far are not encouraging, but it is still early in the game.

N550 was tried next and it has proven to be the most accurate so far. With a 35.5 grains and a 90 grain Berger I registered a group of **.539 at 200**. I increased the load to 38.7 grains and tried the 107 Sierra. This load shot **.221 and .256 at 100; .752 and .675 at 200 yards**.

Clay Spencer donated 100 of his fine 103 grain VLD for this project and they shot the best groups at 200 yards so far. They liked the N550 powder and also H4350. I went to the new range at Goodwill, LA (about 50 miles from my home) and tried my hand at shooting steel gongs at distances from 300 yards to 750 yards. My best loads featured the 105 Berger, the 103 Spencer, and the 107 Sierra pushed by 38.7 grains of N550.

The 6mm Mojo shot by Murry Crowe outperformed my 6XC slightly, but I attribute this to his experience in the long range game.

They have a 600 yard match at this range on March 15th. Although Shakespeare gave us an admonition to beware the Ides of March, I plan to test my new toy at this match.

ANTHONY'S PRECISION RIFLES
HIGH QUALITY RIFLE SMITHING

Specializing in custom ...

- Benchrest rifles
- Varmint rifles
- Remington 700 / XP 100's
- Pillar Bedding

Call: Anthony Pettiti
15539 Usher Street
San Lorenzo, Ca 94580
510-538-1288 (Afternoon's are best)

MORE TESTING

Most of the shooters who shoot this and other similar cartridges tell me that H4350 is **THE** powder. After shooting the 6 PPC for more than 10 years, I may be expecting too much from this cartridge. It will not shoot the tiny groups at 100 and 200 yards that we expect from the PPC. After my session at the Goodwill range, I tried some more groups at the 100/200 yard range on which I normally practice.

As mentioned before, I am testing this cartridge in mid-winter. The mirage has been very distracting....especially on the sunny days. With that excuse out of the way, here are some results at the 100/200 yard range.

This session featured the 105 Berger and the 103 Spencer bullets. I tried both 39.0 grains of H4350 and 39.5 grains. All of these groups were shot with heavy mirage. At 200 yards, the Spencer posted groups of **.586 and .658 with 39.0 plus a .200 at 100 yards**.

With an increase of 1/2 grain (39.5) the Spencer shot **.704, .474, and .658 (5 shot group)**.

The 105 grain Berger showed similar results with **.457, .715** at 200 with the 39.0 charge and **.603, and .624** with 39.5 grains of H4350.

The 39.5 grain load of H4350 seems to be ideal in this Krieger barrel. In some heavy mirage, I managed a **.229** inch, 3-shot group at 200 yards. This was with the 107 grain Sierra VLD. **(Photo #5 shows this 200 yard group)**

600 YARD TESTING

With the approach of the 600 yard match, I decided that I should practice at 600 yards. I don't know what to expect at this distance and this cartridge. I shot one six hundred yard match and used a borrowed 6.5 X .284 Savage F-class rifle for that match.

The hardest part for a short range Benchrest shooter to get accustomed to is the inability to see bullet impact of the last shot.

Most long range shooters have special bases that give about 20 MOA elevation. My system is a little unusual. Coming from short range Benchrest, my rifle was equipped with a Jackie Schmidt "frozen" Leupold 36D and Gene Bukys adjustable mount. For my venture into 600 yard shooting, I replaced the non-adjustable 36X Leupold with a 8X-32X Burris Signature scope in the adjustable mounts.

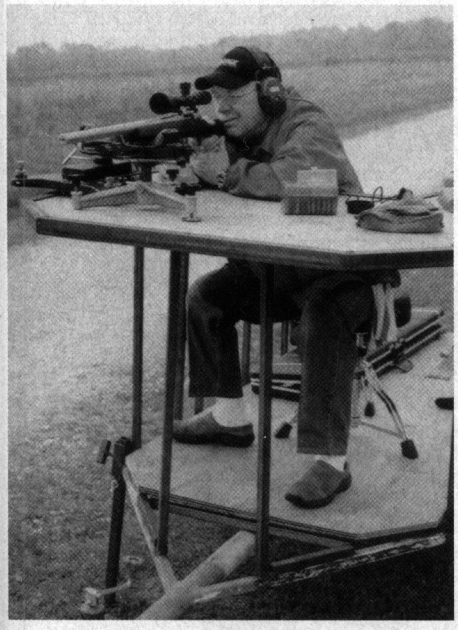
To zero the scope, I adjusted the point of impact with the mount so that the adjustment knobs read zero for 200 yards. The knob was set at "0", one turn from its lowest setting. With that setting I would have plenty of adjustment range from 100 yards to 600 (or more).

My first effort at this distance was using the 107 Sierra and 39.5 grains of H4350. I have more of the Sierra offerings than I do of the other bullets and will probably use them at the 600 yard match. I have some 115 grain Tubb bullets that I want to try. These may be too long for optimal performance in my 8 twist Krieger.

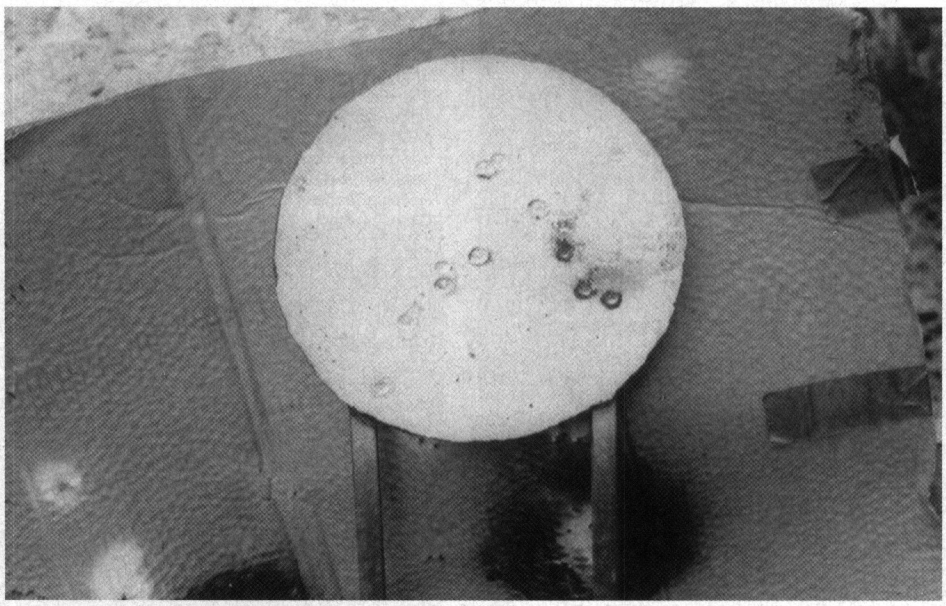
Due to a bout with the flu, I missed the 600 yard match held on 3/15/08. Maybe it was best since that is the Ides of March of which Shakespeare gave us the admonition to "beware of".

The local range has only 100 and 200 yard berms, but a friend, Jerry Breithaupt, devised a way to shoot 600 yards. He built a shooting trailer that can be moved back from the berm to any desired distance. **(Photo #6 is the trailer mentioned)** He built this for prairie dog shooting, but it offers an excellent way to test rifles at the longer distances. Of

Continued on page 22



#6 Jerry Breithaupt demonstrates his ingenious shooting trailer.



#7 A 1 1/2 inch group shot at 600 yards from the trailer.

BRUNO SHOOTERS SUPPLY

NEW PRODUCTS & SPECIALS

Please visit the classified section of www.benchrest.com for other specials!

NEW Bruno "O" Press 395.00
NEW Bruno "C" Press 195.00
NEW Bruno Concentricity Gage 225.00
- Free shipping on the above 3 items
Sightron *NEW* Big Sky 36x Dot or CH 489.09
Hart Barrels Tapered-1.250"<28" 280.00
Shilen Barrels Tapered-1.250"<28" 236.40
Krieger Barrels Tapered-1.250"<28" 279.95
Hawkeye 17" Limited Borescope 519.95
Hawkeye 17" Deluxe Kits 679.95
Hawkeye 17" Deluxe Kit w/Eyepiece 816.00
Hawkeye Angled Eyepiece 250.00
JLC Competition Ratchet Seater 145.00
Federal 205M - 210M Primers 36.95
NEW Kelbly Trigger 234.95

BRUNO

Bruno Barrel Vise Lightweight w/Sleeve 29.95
Bruno Full Length Die 150.00
Bruno Shoulder Bump Die, 6PPC 150.00
Bruno Gold Engraved Side Tension Rest Top 95.00
Bruno Powder Measure Bag 9.95
Bruno Powder Bottles 7.50
Bruno Rifle Barrel Bag 7.95
Bruno Custom Press Carrying Bag Vinyl 14.95

BOOKS

Accurate Varmint Rifle, ... SOFT 14.95; HARD 19.95
Accurizing The Factory Rifle 36.36
Rychetnik Reflects On Guns, Hunting & Days Gone By 16.95
PS Reloading Guide 19.95
PS Benchrest Primer 22.95
Precision Shooting At A 1000 Yards 34.95
Sinclair Int'l Prec. Reloading Handbook 12.95
Varmint Hunter's Odyssey 34.15
Border Wars of the Upper Ohio Valley 24.95
Devils in Baggy Pants ..... SOFT 22.95; HARD 28.95
Rifle Accuracy Facts 34.95
Modern Highpower Competition 31.95
Warren Page Accurate Rifle ..... HC, 22.95; SC,15.95
Precision Shooting with the M-1 Garand 25.00
Complete Guide to AR-15 Accuracy 20.96
Highpower Shooting Primer 32.95
Designing & Forming Custom Cartridges 45.00
Metallic Cartridge Reloading 12.95
Shooters Corner by Don Lewis ..... CALL
Other Side of a Western Legend-SC 12.48
Sierra 5th Edition Reloading Guide 24.95

BRUNO BULLETS

NEW "DOUBLE O BULLETS"
65gr or 68 gr FB 25.00
65 gr or 68 gr BT 26.00

SINCLAIR PRODUCTS

Arbor Press - Stainless 99.75
NT-1000 Neck Turner, mandrel not included 58.50
NT-3000 Neck Turner, mandrel not included 78.00
Mandrels for Neck Turners ..... each 7.95
Concentricity Fixture 79.50
Deluxe Action Cleaning Kit 31.50
Bolt Disengagement Tool (Remington) 24.95

CLEANING RODS

Dewey Rods Sets:
22/6mm - 36" or 44" (22 Cal Jag & Adaptor Inc) 23.95
30 Cal. - 36" or 44" (30 Cal Jag & Adaptor Inc) 23.95
17 Cal. - 36" with Jag 24.95
Add'l Dewey Jags and Adaptors ..... EACH 2.65
Bore Tech Rods - All 34.50
Bore Tech Jags (No Adaptor Needed) 4.25

BRUNO CUSTOM BORE BRUSHES

17 Cal. ..... Per Dozen 15.50
22, 6mm, 25, 6.5, 270, 7mm, 30, 303, 8mm
338, 35, 375, 458 ..... Per Dozen 8.95
22/6mm Nylon ..... Per Dozen 12.15
Pistol - 22, 38, 9mm, 41, 44, 45 ..... Per Dozen 8.95

BORE MOPS

22 Cal, 6MM, 7MM, 30 Cal & Chambers, Per Doz .. 10.00

BRUNO BORE GUIDES

Delrin Plastic with O-ring. Centerfire or Rimfire, ...
specify action and caliber 15.95
AR-15 ..... 17.95
Rimfire - Browning A-Bolt, Win 52, Anschutz 54/64,
Rem 77, Kimber 82 ..... 14.50
We can make for any action/caliber, call w/measurements!

COTTON FLANNEL PATCHES

1 3/8" Square or 1 1/4 Round ..... Per 1000 12.95
1 3/4" Square, 2" Round, 2" Square ..... Per 1000 12.95
17 Cal 3/4" Square, Lg Bore 2 1/4" Square Per 500 9.95
Large Bore 3" Square Per 500 ..... 12.95

SOLVENTS

NEW TM Solution ..... 4 oz. - 5.95; 16 oz. - 15.95

SHOOTERS CHOICE #7
2 oz. w/applicator 3.66
4 oz. 5.49
16 oz. 17.04
Gallon Can 64.63
Quick Scrub III (Degreaser-Aerosol) 5.88

HOPPES
#9 4 oz. 5.95
#9 16 oz. 10.95
#9 32 oz. 16.95

Sweets 7.62 200ML 6.95
Butch's Bore Shine ..... 4 oz - 6.95; 16 oz - 17.95
GM Engine Cleaner 15 oz. 15.95
Bore Tech
Rimfire Blend ..... 4 oz - 9.59; 16 oz - 17.15
Moly Magic ..... 4 oz - 10.28
Benchrest Blend ..... 4 oz.-9.59; 16 oz - 17.15
Eliminator ..... 4 oz. - 10.28; 16 oz - 18.55
KROIL
10 oz. Aerosol 9.19
13 oz. Aerosol 11.25
8 oz. Can 5.78
Gallon Can 49.16
Montana X-Treme, ... 16 oz - 16.95; 4 oz - 6.95;
..... gun grease - 4.95; gun oil 4 oz - 5.95
Leak Proof Solvent Bottles ..... 2 oz, 4.50; 4 oz, 5.50
Iosso 5.95
SLIP 2000
725 / 14oz cleaner degreaser 7.47
Blackpowder lube ..... 16 oz, 9.29; 4 oz, 5.47
Carbon Killer: ..... 5 gal, 109.35; 1 gal, 25.52,
..... 32 oz, 16.73; 16 oz, 12.08, 4 oz, 5.83
Copper Cutter ..... 4 oz, 5.54
Gun Lube ..... 1 oz, 2.51; 4 oz pump spray, 6.20

L.E. WILSON

Straight Line Bullet Seater 37.70
Stainless Steel Micrometer Top Bullet Seater 76.70
Neck Size Die (Less Bushing) 37.70
NEW Stainless Steel Neck Die 52.00
Wilson Steel Bushing 9.95
Redding Steel Bushing 9.95
Redding Titanium Nitride Bushings 16.95
Case Trimmer 31.20
Case Holders 6.50
Bullet Seater Stem and Top (Drift Assembly) 12.35
Wilson Stainless Steel Shoulder Bump Die PPC 65.00

SCOPES

Competition Scopes 35X, 40X, 45X - 45mm,
Dot or CH, Black only 939.95
Weaver 36X Silver Dot or CH 389.95
Weaver 36X Black Matte Dot 389.95
Scope cover for Leupold 45mm, ... Leather - 25.95

PLEASE VISIT OUR WEBSITE

www.brunoshooters.com
e-mail: lbruno@brunoshooters.com

NOW Buying used Leupold 24x & 36x Scope. Call for details.

ALL REDDING PRODUCTS AVAILABLE, ... CALL!!

TRIGGERS

Jewell BR Standard 2 oz. 160.00
Jewell HVR Hunting Varmint Model 160.00
Jewell Model 70 Winchester 205.00
Shilen 2 oz. Competition 107.95
Shilen Std trigger 73.50
NEW Kelbly Trigger 234.95

K & M TOOLS

NEW 50 Cal. Flash Hole Uniformer 25.00
NEW 50 Cal. Complete Neck Turner 85.00
NEW 50 Cal. Complete Case Length Trimmer .. 65.00
NEW 50 Cal. COMBO Nk Turner & Case Trimmer 130.00
NEW 50 Cal. Primer Pocket Tool with Handle ... 35.00
Carbide Neck Turner Pilots, all calibers 36.05
Pee Wee Internal Deburring Tool 17 cal. 9.02
Master Internal Deburring Tool (Std., PPC) 9.02
Prof. Internal Deburring Tool (Std., PPC) 13.77
(Markle) Primer Seater Tool (Deluxe) 37.95
Primer Gage W/Dial Indicator 92.62
Primer Seater Gage W/Dial Indicator 92.62
Neck Turner W/1 Pilot (State Caliber) 56.95
Lee Shell Holder for K&M Seaters & Neck Turners ... 3.00
Primer Pocket Uniformers 20.61
Arbor Presses 74.05
Pilot Jack 11.95

EDGEWOOD SANDBAGS

All Front Bags 55.00
Bench Snake - Filled 55.00
Bolt Holster 55.00
Elbow Bag 55.00
Mini-Gator 136.00
Original 110.00
Standard Gator & Tall Gator 145.00

NON-US CREDIT CARD ORDERS WILL BE CHARGED AN ADDITIONAL 4% HANDLING FEE.

ANY OPTICS RETURNED WITH FACTORY CELLOPHANE REMOVED WILL BE CHARGED A 15% RESTOCKING FEE. NO RETURNS UNDER ANY CIRCUMSTANCES FOR OPTICS THAT HAVE BEEN MOUNTED.

No return policy after 30 days. For mail orders, please include payment with order. Include ample shipping, overpayments will be refunded. *Add $9.00 for C.O.D. orders. All* ***hazardous*** *orders will be shipped FedEx. There is a hazardous materials charge of $20.00 per powder/primer order. All others will be shipped UPS Ground unless requested otherwise. Next Day Air, 2nd Day Air, and 3 Day Select also available for an additional charge. Solvents, aerosols, and rimfire ammo cannot ship by air - ground only. Please specify when ordering. AZ residents add 8.3% sales tax.* ***Prices subject to change without notice.*** A 15% restocking fee will be added to all returns. Not responsible for typographical errors.

BRUNO SHOOTERS SUPPLY

21628 N. CENTRAL AVE, STE 4
PHOENIX, AZ 85024

PHONE: (623) 587-7641
FAX (623) 587-7645
FOR ORDERS ONLY: 1-800-455-0350

M-F 8AM - 5 PM; SAT 9AM - 12 NOON
CLOSED SUNDAYS

VISA MasterCard DISCOVER

BRUNO SHOOTERS SUPPLY

VISIT OUR WEB SITE AT WWW.BRUNOSHOOTERS.COM

NIGHTFORCE SCOPES

NF832 BR 8-32x56 ..... 1211.00
NF1242 BR 12-42x56 ..... 1306.00
NXS4256 12-42x56 ..... 1829.00
NXS3256 8-32x56 ..... 1686.00
NXS2256 5.5-22x56 ..... 1568.00
NXS2250 5.5-22X50 ..... 1568.00
NXS1556 3.5-15x56 ..... 1425.00
NXS1550 3.5-15x50 ..... 1425.00
NXS2510 2.5-10x24 ..... 1193.00
NXS1424 1-4x24 ..... 1154.00

BRASS

Most calibers available in Winchester, Remington, Norma

LAPUA BRASS

220 Russian Neck Turned/6PPC ..... 1.75 ea
223 Rem ..... .39 ea
243 Win ..... .57 ea
308 Win ..... .49 ea
6BR Rem ..... .56 ea
30-06 ..... .67 ea
338 Lapua Mag ..... 1.89 ea
220 Russian ..... .66 ea
6.5x284 Win ..... .84 ea
6.5x55 Swedish ..... .49 ea
6.5x47 ..... .74 ea
20 Tactical ..... .42 ea
6.5 Grendel ..... .71 ea

BULLETS

NEW Double O Bullets
65gr or 68 gr ..... FB, 25.00; BT, 26.00
Bart's Ultra 6mm/68gr, per 500 ..... 122.50
Bart's Wedge 6mm/68gr, per 500 ..... 122.50
Bart's Original 6mm/68gr, per 500 ..... 122.50
Bart's Head Hunters 122.50
Euber 22/52 gr .... 500 - 115.00, 1000 - 230.00
Euber 6mm-65/66/68 FB per 500 ..... 122.50
Euber 6mm-108 gr VLD BT per 400 ..... 140.00
Euber 30 cal-112/116/118 gr per 400 ..... 157.50

ACTIONS

B.A.T. ..... CALL
Hall ..... CALL
Kelbly ..... CALL
Nesika Bay ..... CALL
Stiller ..... CALL
Turbo ..... CALL

ALLIANT GUN POWDER

Reloader 7/15/19/22/25 in 5 lb. Keg .. 91.20
Reloader 7/15/19/22/25 in 1 lb. Keg .. 19.95

HODGDON POWDER

Retumbo, H322, H335, H4831 (SC), H4198, H4895, H4350, H1000, HBLC2, Varget, H50BMG, H380, H414, H4227, Benchmark 8 lb. 129.54
H110, 8 lb. 117.33

ALL IMR 8 LB. KEGS 126.88
ALL Vihta Vuori, 100 Series, 8 lb. 149.99
Vihta Vuori 20N29 & 24N41, 8 lb. 201.46
Most Vihta Vuori Series 100, 1 lb. 27.73
Most Vihta Vuori Series 300 ..... 1 lb. 28.26; 4 lb. 95.98
Vihta Vuori Series 500, 2 lb. 57.31

A FEDEX HAZARDOUS MATERIAL CHARGE OF $20.00 WILL BE ADDED TO EACH BOX. UP TO 40 LBS. CAN BE SHIPPED PER BOX.

HAWKEYE BORESCOPES

17" Limited Focus Kit 519.95
17" Deluxe Focusing Kit - includes Hard Carry Case 679.95
17" Deluxe Focusing Kit - Same as above but with 3" Angled Eyepiece. 816.00
3" Angled Eyepiece 250.00

RIMFIRE AMMO

Wolf Match Extra 630.00/case, 6.30/box
Wolf Match Target 414.00/case, 4.14/box
SK Match 630.00/case, 6.30/box
SK Standard Plus 414.00/case, 4.14/box
SK Pistol Match 498.00/case, 4.98/box
SK Rifle Match 564.00/case, 5.64/box

Eley
Biathalon Match 972.00/case, 10.14/box
Biathalon Sport 483.00/case, 5.04/box
Sport 228.00/case, 2.38/box

Practice USA Shooting 431.00/case, 4.50/box
Target Rifle 469.00/case, 4.90/box
Standard Rifle 412.00/case, 4.30/box
Silhouex Rimfire 580.00/case, 6.05/box
Super Silhouex 455.00/case, 4.75/box
Match EPS 979.00/case, 10.21/box
Match EPS Semi-Auto 979.00/case, 10.21/box
Match EPS USA Shooting 1024.00/case, 10.68/box
Tenex Ultimate EPS . 1467.00/case, 15.31/box
Tenex Ult EPS Semi-Auto 1467.00/case, 15.31/box
Club EPS 566.00/case, 5.90/box
Club Extra 566.00/case, 5.90/box
Pistol Match 940.00/case, 9.80/box
Pistol Standard 412.00/case, 4.30/box
Pistol Extra 712.00/case, 7.43/box
Rapid Fire Match 940.00/case, 9.80/box
Rapid Fire Practice 469.00/case, 4.90/box
Subsonic Hollow Point . 585.00/case, 6.11/box
Target Pistol 469.00/case, 4.90/box
Rabbit HVHP 585.00/case, 6.11/box
Rabbit HVSP 585.00/case, 6.11/box
17 Mach 2 - 17 gr. Vmax Bullet .. 514.00 / 5.36

RWS
High Velocity 7.15
R100 ..... 14.30
R50 ..... 14.30
Rifle Match 40 gr. 8.77
.22 Short 28 gr. 14.95
Subsonic HP 40 gr. 5.85
Target 40 gr. 5.52

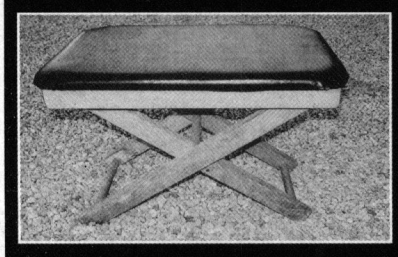
Lapua
Midas M or L 1518.00/case, 16.26/box
Master M or L 908.00/case, 9.55/box
Hollow Point 718.00/case, 7.46/box
Subsonic HP 718.00/case, 7.46/box
Standard Club 518.00/case, 5.26/box
Super Club 518.00/case, 5.26/box

MCMILLAN EDGE
LV Stock - $349.95
Hunter Class Stock - $349.95

LEUPOLD COMPETITION SCOPES
35X, 40X, 45X
Crosshair or Dot, Black Matte Only
$939.95

*** NOW BUYING ***
LEUPOLD 24X & 36X USED SCOPES
Call for details.

NEW Bruno Adjustable Shooting Stool



All Oak Design. Padded Vinyl Seat. Folds to 4"H x 24"L x 15"W.

Rises to 16" At Its Lowest Setting, And Up To 21" At Its Highest Setting.

Will Accommodate Any Bench Height In The USA.

$75.00 Includes FREE Shipping In The Continental USA.
100% Money Back Guarantee If Not Satisfied.

NO CREDIT CARD FEE!
except Non-USA cards
4% additional.

BRUNO SHOOTERS SUPPLY

WE ALSO CARRY FULL LINES OF NIKON, SWAROVSKI, KAHLES, BUSHNELL AND ZEISS.

ALL LEUPOLD SCOPES AVAILABLE

VX-7

63170 3.5-14X56 LR Satin XT Duplex $1630.44
63175 3.5-14X56 LR Satin Boone & Crockett $1722.03
63180 6.5-14X56 LR Satin Varmint Hunters $1722.03
63185 4.5-18X56 LR Satin Fine Duplex $1722.03
63190 4.5-18X56 LR Satin Boone & Crockett $1813.63
63195 4.5-18X56 LR Satin Varmint Hunters $1813.63

VX-L

60325 4.5-14X50 Matte Duplex $731.76
60465 3.5-10X56 Matte Duplex $874.24
60360 4.5-14X56 LR/T Matte Duplex $874.24
60365 4.5-18X56 LR/T Matte Varmint Hunters $935.31
60375 6.5-20X56 LR Matte Fine Duplex $976.02
60385 6.5-20X56 LR/T Matte Target Dot $986.19

VX-3

55152 6.5-20X40 AO Matte Fine Duplex $594.37
55154 6.5-20X40 AO Matte TGT Dot $624.90
55142 6.5-20X40 LR Gloss Fine Duplex $604.54
55146 6.5-20X40 LR Matte Fine Duplex $604.54
57175 6.5-20X40 LR Matte Leupold Dot $665.61
55148 6.5-20X40 LR Silver Fine Duplex $604.54
55172 6.5-20X50 LR/T Matte Fine Duplex $736.85
55176 6.5-20X50 LR/T Matte TGT Dot $767.38
57180 6.5-20X50 LR/T Matte Varmint Hunters $797.92
55178 6.5-20X50 LR/T Silver Fine Duplex $736.85
55186 8.5-25X50 LR/T Matte Fine Duplex $808.09
55188 8.5-25X50 LR/T Matte TGT Dot $838.63
57185 8.5-25X50 LR/T Matte Varmint Hunters $869.16

VX-2

57010 6-18X40 AO Matte Fine Duplex $434.57
57020 6-18X40 AO Matte TGT Dot $465.11
57040 6-18X40 AO TGT Matte Fine Duplex $465.11
57100 6-18X40 AO TGT Matte TGT Dot $495.64

COMPETITION

53430 35X45 Matte TGT Crosshair $939.95
53432 35X45 Matte 1/8 MIN TGT Dot $939.95
53434 40X45 Matte TGT Crosshair $939.95
53436 40X45 Matte 1/8 MIN TGT Dot $939.95
53438 45X45 Matte TGT Crosshair $939.95
53440 45X45 Matte 1/8 MIN TGT Dot $939.95
61515 25X40 AO Silhouette Matte 3/8 Leup Dot $549.59
61520 25X40 AO Silhouette Matte ½ Leup Dot $549.59
61555 30X40 AO Silhouette Matte 3/8 Leup Dot $549.59
61560 30X40 AO Silhouette Matte ½ Leup Dot $549.59

FIXED POWER

58600 6X42 Matte Heavy Duplex $351.12
58620 6X42 Matte Wide Duplex $351.12
58650 12X40 AO TGT Matte Fine Duplex $493.60
58660 12X40 AO TGT Matte Leupold Dot $524.14

MARK 4 LR/T

54680 6.5-20X50 LR/T M1 MD $1002.48
56080 6.5-20X50 LR/T MI Illum MD $1155.14
54690 8.5-25X50 LR/T M1 MD $1099.17
56090 8.5-25X50 LR/T M1 Illum MD $1251.83

BURRIS SCOPES — FULL LINE AVAILABLE

XTREME TACTICAL XTR 30MM

201914 3-12X50 MD Matte $647.36
201916 3-12X50 Illum BMD 12X $774.08
201932 6-24X50 FWL Plex $709.24
201933 6-24X50 BMD 14X $818.28

BLACK DIAMOND 30MM

200933 6-24X50 Fine Plex Matte TAR-SIDE PA $653.25
200934 6-24X50 Ballistic MD Matte TAR-SIDE PA $735.77
200942 8-32X50 Fine Plex Matte TAR-SIDE PA $682.72
200943 8-32X50 Ballistic MD Matte TAR-SIDE PA $778.01

SIGNATURE SELECT

200823 6-24X44 Fine Plex Matte TGT/PA $486.25
200824 6-24X44 Ballistic Plex Matte TGT/PA $560.91
200867 8-32 Fine Plex Matte TGT/PA $500.01
200868 8-32 Ballistic MD Matte TGT/PA $570.73

TIMBERLINE 1"

201312 4X-20MM Plex Matte $142.44
201322 2-7X26 Plex Matte $142.44
201323 2-7X26 Ballistic Plex Matte $146.37
201333 3-9X32 Plex Matte $162.08
201334 3-9X32 Ballistic Plex Matte $166.01
201343 4.5-14X32 Plex Matte $181.73
201344 4.5-14X32 Ballistic Plex Matte $185.66

FULLFIELD II

200191 6.5-20X50 Fine Plex Matte PA $389.99
200192 6.5-20X50 Fine Plex Matte TGT/PA $412.57
200193 6.5-20X50 Ballistic MD Matte PA $466.61

NIGHTFORCE OPTICS

NXS 1-4X24mm $1154.00
NXS 2.5-10X24mm $1193.00
NXS 3.5-15X50mm $1425.00
NXS 3.5-15X56mm $1425.00
NXS 5.5-22X50mm $1568.00
NXS 5.5-22X56mm $1568.00
NXS 8-32X56mm $1686.00
NXS 12-42X56mm $1829.00
BR 8-32X56mm $1211.00
BR 12-42X56mm $1306.00

WEAVER SCOPES
ALL WEAVER SCOPES AVAILABLE, PLEASE CALL!

CLASSIC EXTREME

800701 1.5-4.5x24 Matte G4 ..... $395.45
800702 1.5-4.5x24 Matte Duplex $395.45
800703 2.5-10x50 SF Matte G4 ..... $520.10
800704 2.5-10x50 Matte Duplex $520.10
800705 2.5-10x56 SF Matte G4 ..... $526.44
800706 2.5-10x56 SF Matte Duplex $526.44

GRAND SLAM RIFLESCOPES

800471 1.2-5x32 Black Matte Duplex $269.42
800473 3-10x40 Black Matte Duplex $245.87
800475 4.5-14x40 W/AO Black Matte Duplex $320.98
800469 6.20x40 W/AO Black Matte Duplex Dot $332.01
800476 6.20x40 W/AO Black Matte FCH Dot $332.01
800588 3-10x40 A/O Silver Duplex $244.72

T-SERIES RIFLESCOPES

849976 Target T-24 1/8 MOA dot $363.10
849970 Target T-36x40 FCH Dot Matte $389.95
849981 Target T-36x40 FCH Dot Silver $389.95
849974 Target T-36x40 1/8 Dot Matte $389.95
849969 Target T-36x40 1/8 Dot Silver $389.95

CLASSIC V-SERIES RIFLESCOPES

849400 V-3 1-3x20 Matte Duplex $139.72
849399 V-7 2-7x32 Matte $140.28
849402 V-9 3-9x38 Matte MD $140.28
849405 V-10 2-10x38 Matte Duplex $155.94
849408 V-16MDX 4-16x42 Matte Duplex $260.65
849409 V-16MFC 4-16x42 Matte FCH $260.65
849410 V-16MDT 4-16x42 Matte FCH Dot $260.65
849411 V-24 6-24x42 Matte Duplex Dot $303.91
849412 V-24 6-24x42 Matte MD $315.29

CLASSIC RIMFIRE RIFLESCOPE

849431 2.5-7X28 Matte Duplex $118.36

CLASSIC HANDGUN

849429 2.5-8X28 Matte Duplex $182.13

RIFLE ACTIONS - MCMILLAN 50 CAL, STOLLE PANDA AND GRIZZLY, BAT, NESIKA BAY, HALL, VIPER, TURBO4

KRIEGER, SHILEN, HART, BARTLEIN RIFLE BARRELS - MANY IN STOCK, CALL FOR PRICES

Mcmillan Fiberglass/Graphite stocks CALL.
McMILLAN'S NEW — EDGE - STOCK NOW AVAILABLE
Call for prices and color combinations in stock.
We also carry Hodgdon, IMR, Winchester, Vihta Vuori Oy gun powders, Federal, CCI, Remington, Winchester primers, Bruno, Berger, Bart's, Rubright, Sierra, Nosler bullets, Wilson, Redding, Sinclair, Dewey, Bore-Tech, Protektor sandbags, K&M, Davidson, Hoppe's, Slip 2000, Shooter's Choice, Butch's Bore Shine, Montana Extreme, cotton flannel patches, cleaning brushes, bore guides, Federal, Eley, Lapua, CCI, Winchester Wolf and SK Rimfire ammunition,and many other items. Please call or Write for a complete listing.

Custom Benchrest and Varmint rifles built to your specifications. Please Call for a custom quote.

WE ACCEPT MASTERCARD, VISA, AND DISCOVER.

NON-US ORDERS WILL BE CHARGED ADDITIONAL 4% HANDLING FEE.

NO RETURNS AFTER 30 DAYS. 15% RESTOCKING FEE ON ALL RETURNS. FOR MAIL ORDERS, PLEASE INCLUDE PAYMENT WITH ORDER. INCLUDE AMPLE SHIPPING. OVERPAYMENTS WILL BE REFUNDED. ADD $9.00 FOR C.O.D. ORDERS. ALL HAZARDOUS ORDERS WILL BE SHIPPED FEDEX. THERE IS A HAZARDOUS MATERIALS CHARGE OF $20.00 PER POWDER/ PRIMER ORDER. ALL OTHERS WILL BE SHIPPED UPS GROUND UNLESS REQUESTED OTHERWISE. NEXT DAY AIR, 2ND DAY AIR, AND 3 DAY SELECT ALSO AVAILABLE FOR AN ADDITIONAL CHARGE. PLEASE SPECIFY WHEN ORDERING. AZ RESIDENTS PLEASE ADD 8.3 % SALES TAX. DEALER PRICES AVAILABLE UPON RECEIPT OF SIGNED F.F.L. PRICES SUBJECT TO CHANGE WITHOUT NOTICE. NOT RESPONSIBLE FOR TYPOGRAPHICAL ERRORS.

BRUNO SHOOTERS SUPPLY
21628 N. CENTRAL AVENUE #4 PHOENIX AZ 85024
PHONE 623-587-7641 FAX 623-587-7645
ORDERS ONLY 1-800-455-0350

www.brunoshooters.com
lbruno@brunoshooters.com

www.brunoshooters.com
lbruno@brunoshooters.com

BRUNO SHOOTERS SUPPLY

All Leupold scopes available, please call!

VX / 7

63100 1.5-6X24 Satin XT Duplex $1121.56
63110 1.5-6x24 Satin German #4 ..... $1167.32
63105 1.5-6x24 Satin Circle Dot $1177.54
63115 1.5-6x24 Satin Gray XT Duplex $1202.98
63120 2.5-10x45 Satin XT Duplex $1202.98
63130 2.5-10x45 Satin German #4 ..... $1248.77
63125 2.5-10x45 Satin Boone & Crockett $1294.58
63135 2.5-10x45 Satin Gray XT Duplex $1284.40
63140 3.5-14x50 LR Satin XT Duplex $1284.40
63155 3.5-14x50 LR Satin German #4 ..... $1330.19
63145 3.5-14x50 LR Satin Boone & Crockett $1376.00
63150 3.5-14x50 LR Satin Varmint Hunters $1376.00
63160 3.5-14x50 LR Satin Gray XT Duplex $1365.82
63165 3.5-14x50 LR Satin Gray Varmint Hunters $1457.42
63170 3.5-14x56 LR Satin XT Duplex $1630.44
63175 3.5-14x56 LR Satin Boone & Crockett $1722.03
63180 3.5-14x56 LE Satin Varmint Hunters $1722.03
63185 4.5-18x56 LR Satin Fine Duplex $1722.03
63190 4.5-18x56 LR Satin Boone & Crockett $1813.63
63195 4.5-18x56 LR Satin Varmint Hunters $1813.63

VX / L

60350 3.5-10x50 Matte Duplex $665.61
60355 3.5-10x50 Matte Boone & Crockett $726.67
60325 4.5-14x50 Matte Duplex $731.76
60363 4.5-14x50 Matte Boone & Crockett $792.82
60335 4.5-14x50 Matte Varmint Hunters $792.82
60344 3.5-10x56 Matte Duplex $813.18
60465 3.5-10x56 Matte German #4 ..... $843.71
60475 3.5-10x56 Matte Boone & Crockett $874.24
60360 4.5-14x56 LR Matte Duplex $874.24
60370 4.5-14x56 LR Matte Boone & Crockett $935.31
60365 4.5-14x56 LR Matte Varmint Hunters $935.31
60375 6.5-20x56 LR Matte Fine Duplex $976.02
60385 6.5-20x56 LR/T Matte Target Dot $986.19
62200 6.5-20x56 LR/T Matte Varmint Hunters $1016.73
60390 6.5-20x56 LR Extreme Varmint VH Ret $1103.24

VX / 3

55002 1.5-5x20mm Gloss, duplex $383.69
55004 1.5-5x20mm Gloss, heavy duplex $383.69
55006 1.5-5x20mm matte, duplex $383.69
55008 1.5-5x20mm matte, heavy duplex $383.69
55010 1.5-5x20mm matte, german #4 ..... $414.22
54902 1.5-5x20mm illum. Reticle matte, 30mm, duplex ... $536.35
54904 1.5-5x20mm illum. Reticle matte, 30mm, german #4 dot $536.35
54906 1.5-5x20mm illum. Reticle matte, 30mm, circle dot $536.35
55036 1.75-6x32mm matte, duplex $383.69
55024 1.75-6x32mm matte, heavy duplex $383.69
55032 2.5-8x36mm gloss, duplex $383.69
63400 2.5-8x36mm gloss, Boone & Crockett $444.75
55034 2.5-8x36mm matte, duplex $383.69
57150 2.5-8x36mm matte, Boone & Crockett $444.75
55038 2.5-8x36mm silver, duplex $383.69
63480 2.5-8x36mm silver, Boone & Crockett $444.75
55042 3.5-10x40mm gloss, duplex $451.88
63405 3.5-10x40mm gloss, Boone & Crockett $512.95
55046 3.5-10x40mm matte, duplex $451.88
57155 3.5-10x40mm matte, Boone & Crockett $512.95
55050 3.5-10x40mm silver, duplex $451.88
63485 3.5-10x40mm silver, Boone & Crockett $512.95
55072 3.5-10x50mm gloss, duplex $512.95
55074 3.5-10x50mm gloss, heavy duplex $512.95
55076 3.5-10x50mm matte, duplex $512.95
55078 3.5-10x50mm matte, heavy duplex $512.95
57160 3.5-10x50mm matte, boone & crockett $574.01
54912 3.5-10x50mm illum. Reticle matte, 30mm, duplex . $665.61
54918 3.5-10x50mm illum. Reticle matte, 30mm, german #4 dot $665.61
55082 3.5-10x50mm silver, duplex $512.95
55094 4.5-14x40mm matte, duplex $482.41
57135 4.5-14x40mm matte, boone & crockett $523.48
55114 4.5-14x40mm long range gloss, duplex $542.46
55118 4.5-14x40mm long range matte, fine duplex $542.46
55120 4.5-14x40mm long range matte, duplex $542.46
55265 4.5-14x40mm long range matte, boone & crockett $603.52
55275 4.5-14x40mm long range matte, varmint hunters .. $603.52
57950 4.5-14x50mm matte, duplex $542.46
57970 4.5-14x50mm matte, heavy duplex $542.46
57980 4.5-14x50mm matte, boone & crockett $603.52
57990 4.5-14x50mm matte, varmint hunters $603.52
58020 4.5-14x50mm silver, duplex $542.46
58030 4.5-14x50mm silver, boone & crockett $603.52
58040 4.5-14x50mm silver, varmint hunters $603.52
55132 4.5-14x50mm long range matte, 30mm, duplex $624.90
57140 4.5-14x50mm long range matte, 30mm, boone & crockett $685.96
54922 4.5-14x50mm long range illum matte, 30mm, fine duplex $777.56
54928 4.5-14x50mm long range illum matte, 30mm, german #4 ..... $777.56
62160 6.5-20x40mm AO matte, fine duplex $543.48
62165 6.5-20x40mm AO matte, target dot $574.01
62170 6.5-20x40mm AO matte, varmint hunters $604.54
55142 6.5-20x40mm long range gloss, 30mm, fine duplex $604.54
63465 6.5-20x40mm LR gloss, varmint hunters $574.01
55146 6.5-20x40mm long range matte, 30mm, fine duplex $604.54
57175 6.5-20x40mm long range matte, 30mm, varmint hunters $665.61
55148 6.5-20x40mm long range silver, 30mm, fine duplex $604.54
63495 6.5-20x40mm LR silver, varmint hunters $665.61
55172 6.5-20x50mm long range target matte, 30mm, fine duplex $736.85
55176 6.5-20x50mm long range target matte, 30mm, target dot $767.38
57180 6.5-20x50mm LR/T matte, 30mm, varmint hunters $797.92
55178 6.5-20x50mm long range target silver, 30mm, fine duplex $736.85
63500 6.5-20x50 LR/T silver, varmint hunters $797.92
55186 8.5-25x50mm long range target matte, 30mm, fine duplex $808.09
55188 8.5-25x50mm long range target matte, 30mm, target dot $838.63
57185 8.5-25x50mm LR/T matte, 30mm, varmint hunters $869.16

VX / 2

56700 1-4X20mm matte, duplex $276.83
56730 2-7x33mm matte, duplex $276.83
56740 2-7x33mm matte, Leupold dot $307.63
56760 3-9x40mm gloss, duplex $276.83
56770 3-9x40mm gloss, heavy duplex $276.83
56775 3-9x40mm gloss, wide duplex $276.83
56780 3-9x40mm matte, duplex $276.83
56855 3-9x40mm matte, wide duplex $276.83
56790 3-9x40mm matte, Leupold dot $307.36
56830 3-9x40mm matte, German #4 ..... $307.36
56850 3-9x40mm silver, duplex $276.83
56865 3-9x40mm silver, wide duplex $276.83
56880 3-9x50mm gloss, duplex $368.43
56890 3-9x50mm gloss, heavy duplex $368.43
56900 3-9x50mm matte, duplex $368.43
56910 3-9x50mm matte, heavy duplex $368.43
56905 3-9x50mm matte, wide duplex $368.43
56940 3-9x50mm matte, german #4 ..... $398.96
56950 4-12x40mm AO matte, fine duplex $388.78
56960 4-12x40mm AO matte, leupold dot $419.31
57000 4-12x40mm AO silver, fine duplex $388.78
57010 6-18x40mm AO matte, fine duplex $434.57
57020 6-18x40mm AO matte, target dot $465.11
57040 6-18x40mm AO target matte, fine duplex $465.11
57100 6-18x40mm AO target matte, target dot $495.64

VX-I SCOPES

56610 2-7x33mm gloss, wide duplex $188.28
56550 2-7x33mm matte, duplex $188.28
56620 2-7x33mm matte, wide duplex $188.28
56630 3-9x40mm gloss, wide duplex $202.53
56600 3-9x40mm matte, duplex $202.53
56640 3-9x40mm matte, wide duplex $202.53
53753 4-12x40mm gloss, duplex $243.24
56660 4-12x40mm gloss, wide duplex $243.24
56650 4-12x40mm matte, duplex $243.24
56680 4-12x40mm matte, wide duplex $243.24

RIFLEMAN

56150 Rifleman 2-7x33mm matte, wide duplex $188.28
56160 Rifleman 3-9x40mm matte, wide duplex $202.53
56170 Rifleman 4-12X40mm matte, wide duplex $243.24
58160 Rifleman 3-9x50mm matte, wide duplex $274.79

COMPETITION SERIES

53430 35x45mm matte, target CH $939.95
53432 35x45mm matte, 1/8 min dot $939.95
53434 40x45mm matte, target CH $939.95
53436 40x45mm matte, 1/8 min dot $939.95
53438 45x45mm matte, target CH $939.95
53440 45x45mm matte, 1/8 min dot $939.95
61515 25x40mm AO silh matte 3/8 Leup dot $549.59
61520 25x40mm AO silh matte 1/2 Leup dot $549.59
61555 30x40mm AO silh matte 3/8 Leup dot $549.59
61560 30x40mm AO silh matte 1/2 Leup dot $549.59
58630 6x42 AO comp hunter matte target dot $427.46

AIR RIFLE EFR SCOPES

55152 6.5-20x40mm EFR target matte, fine duplex $594.37
55154 6.5-20x40mm EFR target matte, target dot $624.90

MARK 4 TACTICAL SCOPES

59100 1.5-5x20mm MR/T (1 inch), matte SPR $512.95
52155 3x14mm CQ/T matte, circle dot $768.40
52218 3.5-10x40mm M1 matte, duplex $778.57
52128 3.5-10x40mm M1 matte, mil dot $880.35
53668 3.5-10x40mm M1 matte illum, mil dot $1033.01
51182 3.5-10x40mm M3 matte, duplex $819.28
51850 3.5-10x40mm M3 matte, mil dot $921.06
53672 3.5-10x40mm M3 matte illum, mil dot $1073.72
54660 4.5-14x50mm M1 matte, duplex $859.99
54560 4.5-14x50mm M1 matte, mil dot $961.77
56070 4.5-14x50mm M1 matte illum, mil dot $1114.43
54680 6.5-20x50mm M1 matte, mil dot $1002.48
56080 6.5-20x50mm M1 matte illum, mil dot $1155.14
54690 8.5-25x50mm M1 matte, mil dot $1099.17
56090 8.5-25x50mm M1 matte illum, mil dot $1251.83

ALL LEUPOLD BINOCULARS AND SPOTTING SCOPES AVAILABLE, PLEASE CALL

ALSO CARRYING FULL PRODUCT LINES OF: SWAROVSKI, KAHLES, NIKON, WEAVER, & BURRIS. CALL FOR INFORMATION & PRICING.

NON-US WILL BE CHARGED ADDITIONAL 4% HANDLING FEE.

ANY OPTICS RETURNED WITH FACTORY CELLOPHANE REMOVED WILL BE CHARGED A 15% RESTOCKING FEE. NO RETURNS UNDER ANY CIRCUMSTANCES FOR OPTICS THAT HAVE BEEN MOUNTED.

NO RETURN POLICY AFTER 30 DAYS. 15% RESTOCKING FEE ON ALL RETURNS. FOR MAIL ORDERS, PLEASE INCLUDE PAYMENT WITH ORDER. INCLUDE AMPLE SHIPPING. OVERPAYMENTS WILL BE REFUNDED. ADD $9.00 FOR C.O.D. ORDERS. ALL **HAZARDOUS** ORDERS WILL BE SHIPPED FEDEX. THERE IS A HAZARDOUS MATERIALS CHARGE OF $20.00 PER POWDER/ PRIMER ORDER. ALL OTHERS WILL BE SHIPPED UPS GROUND UNLESS REQUESTED OTHERWISE. NEXT DAY AIR, 2ND DAY AIR, AND 3 DAY SELECT ALSO AVAILABLE FOR AN ADDITIONAL CHARGE. PLEASE SPECIFY WHEN ORDERING. SOLVENTS, AEROSOLS, AND RIMFIRE AMMO CANNOT SHIP BY AIR - GROUND ONLY. AZ RESIDENTS PLEASE ADD 8.3% SALES TAX. DEALER PRICES AVAILABLE UPON RECEIPT OF SIGNED F.F.L. PRICES SUBJECT TO CHANGE WITHOUT NOTICE. NOT RESPONSIBLE FOR TYPOGRAPHICAL ERRORS.

BRUNO SHOOTERS SUPPLY
21628 N. CENTRAL AVENUE #4
PHOENIX AZ 85024
PHONE: 623-587-7641 FAX: 623-587-7645
ORDERS ONLY: 1-800-455-0350

www.brunoshooters.com
lbruno@brunoshooters.com

VISA MasterCard DISCOVER

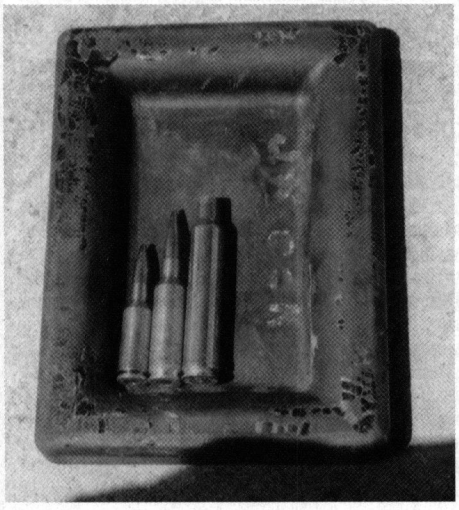
The 6mm At Long Range

Continued from page 17

course, one must use this when there is no one using the range since the path of the bullet is just to the right of the firing line.

I settled on the 39.5/H4350/107 Sierra to test at the longer distance. The 103 grain Spencer will shoot a little smaller at 200 yards, but I have more of the Sierras and have settled on this as my "go-to" load.

Although I have yet to shoot the BAT/6XC in a match, I believe that it will serve my purposes. In the short range game, I shoot the 6 PPC with .237 bore most of the time. When I ordered the Krieger for the 6XC, I specified the .237 bore. Later, I found that most who shoot the fast twist 6 MM's use the .236 bore for the VLD bullets...live and learn.



#8 A 6PPC, a 6XC and a .300 Weatherby case.

Since I have been more than three months writing this article, I decided that I would finish it today. At eight o'clock this morning, Jerry Breithaupt and I started our testing. After a couple of 3-shot groups at 200 yards, we loaded our rests on the trailer and moved back to 500 yards. **(Photo #6 shows the rifle capable of 1/2 inch groups at 200 yards)**.

I used a computer generated drop table for the load that I was shooting. I decided to shoot a few rounds at 500 yards before moving to 600. The table that I was using worked pretty well and I moved back to 600 yards. My first round hit 2 inches low and about four inches left on the gong. I fired two or three more rounds to see if the wind was causing the left drift. It was and I clicked the scope two, 1/8th minute clicks for the wind.

After painting the 10 inch gong, I returned to the trailer and fired a three shot group. **(Photo #7 shows the 1 1/2 inch group)**. I was very pleased with the performance of this load.

Jerry shot the same distances with his .204 rifles. He has a Ruger LR Varmint and a Remington 700 Varmint model. He shot both 500 and 600 yards with both rifles. Although 600 yards is stretching the 32 grain bullets to the max, I was impressed with this little cartridge. They shot well at 500 but seemed to run out of steam at 600.

As I was getting ready for another go at the 600 yard gong, the rain came down.

IMPRESSIONS OF A 6MM FOR LONG RANGE

Let me make it clear, I am a novice shooter at long range. The testing of this 6XC revealed many of my short comings when the distance exceeds the 200 yards that I normally shoot.

I plan to shoot some long range (600 yards) matches in the near future, and I don't feel handicapped using the little 6XC. Although the 6 PPC seems to shoot tighter aggs at distances up to 300 meters, the 6XC definitely holds an edge at distances farther than that. The big capacity .30's will give less wind drift at 1000 yards but there is a price to pay in the recoil department. **(Photo #8 shows the 6PPC, the 6XC and a case from the .300 Weatherby.)**

This long range shooting is very challenging, but it is great change of pace for those of us who shoot "point blank" matches. Good Shooting,

James Mock

"the *TM* solution"
Formulated with 25 years Shooting Experience

GUNS Magazine, Hunting/Shotgun Editor, Holt Bodinson states:
"It's the Crown Prince of Cleaners"

Try it! You will agree.
*You **will not** want to use anything else!*

***TM* Bore Cleaning Solvent**
Are you tired of Carbon, Copper, Lead & annoying ***"ammonia"*** smells? Then ***TM* Bore Cleaning Solvent** is your answer. It is ammonia free; starts dissolving carbon & copper on contact **AND** it's water soluble for easy cleanup.

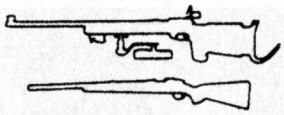
- Non-petroleum. Capable of cleaning any modern centerfire, rimfire or muzzle loading firearm.
- Goes to work immediately dissolving carbon, lead, plastic, black powder and powder fouling, Then works on any copper fouling.
- Not harmful to barrels.
- Bronze bore brush compatible.
- Solvent remains in contact with the full 360 degrees of the bore; low evaporation rate.

***TM* Ultra Bolt Grease** formulated to provide superior performance in the lubrication of high-load surfaces. Complete with polymer additives providing superior adhesive properties.
***TM* M-24 Firearms Maintenance Oil** is blended with all the features needed to protect against corrosion and rust. It is free of silicone, and is a penetrant that will displace moisture.

Telephone/Fax: 260-485-5389 ♦ 6355 Maplecrest Rd., Fort Wayne, IN 46835
E-mail: tmstockworks@comcast.net ♦ Web Page:www.tmss.net

RUSS HAYDON'S SHOOTERS' SUPPLY

15018 Goodrich Dr. • Gig Harbor, WA 98329 • Ph. (253) 857-7557 • Fax (253) 857-7884
Toll Free Order Line (877) 663-6249 • Email: mjwms@centurytel.net



Benchrest • Target • Varmint

HAYDON

Carbide Primer Pocket Uniformer w/screwdriver type handle. spec sm or lg rifle, or Lapua 30.95
Carbide Primer Pocker Uniformer, cutter only - spec sm or lg rifle, or Lapua 21.50
Case Prep Kit - PP Uniformer w/handle (spec. LR, SR or Lapua) brush adapter & flash hole tool (PPC or Std) . 45.95
Flash Hole Deburring Tool- specify Std or PPC 17.95
Mirage Shade, mylar, attaches to barrel 3.00, 2/5.00
Base for Wilson dies 8.95
Rimfire Delrin Rod Guide for Winchester 52, Anschutz 54, Remington 40x Rimfire, Remington .37, Ruger 77/22, Others specify rifle 18.95
Alum. Guide for new Kimber 22RF 23.95
Centerfire Cleaning Rod Guide, "O" ring type - specify bothrifle & cartridge ..... std. 18.95, special order 20.95
AR15/M16 Breech Rod Guide. "O" ring type 19.95
Cleaning Rod Guide, "O" ring type with built-in solvent port - specify rifle & cartridge 22.95
Scope Ring Lapping Kit, ... 1" - 24.95; 30mm - 28.95
Arbor Press 97.50
Arbor Press Kit - press, die base, bushing, std. Wilson neck die & bullet seater (spec. cartridge) 179.95
Action Wrench ..... from 42.95
Barrel Vise 47.95
Bullet Moly coating service, per 100 bullets 2.50
Mainspring Changing Tool 19.95
Rem 700 SS Adapters, glue in, .. short/med or long 11.95
Scope Bases for Rem, Hall, Shilen, 2 pc. 19.95
Nesika Bay 27.95
Extra Long Rear Leather Sandbag "The Hump" from 79.95
Sighter Screw for Rest 64.95
Windage Rest Top (no post or mariner wheel) 139.95

WILSON

Stainless Steel Dies: Neck Sizer 54.95
Stainless Micrometer Bullet Seater 78.95
Case Trimmer less case holder 31.95
Case Holder for Trimmer, Standard - spec. cartridge . 7.50
Straight Line Seater - specify cartridge 38.95
Neck Sizer Die less bushing - specify cartridge 38.95
Bushing - specify size 10.95
Blank Neck Die or Blank Seater Die - specify caliber 34.95
New Stainless Shoulder Bump Die, 6PPC 66.95

BRUSHES & MOPS

Brass Core w/Bronze Bristle Brush calibers through .30 ..... 1.00 ea. or 9.50/doz.
Larger rifle (through 45) & all pistol calibers ..... 1.25 ea.
Brass Core with Nylon Bristle Brush .22, 6mm, .270-7mm, .30 ..... 1.00 ea. or 9.50/doz.
.17 Rifle Brushes, bronze or nylon .... 1.35 ea., 13.50/doz.
Bore Mops, Brass Core, also great as Chamber Swabs .17, .20, .22, .24/27, .30/35, .38 & .45 ..... 1.95
Iosso Heavy Duty Nylon Brush 3.25

DEWEY MFG

Nylon coated Rods complete with brush adapter & jag .17 C x 36" (jag only with .17 as no adapter required) .22 x 36" or 44", .270 & up x 36" or 44" 24.50
Other Specialty Rifle & Pistol Rods Available, .. please call
Brass Jags - .17, .20, .22, .24-6mm, 6.5, .27-7mm, .30 .... 3.50
Brass Brush Adapter-specify .22 rod or.270 & up rod 2.95

HORNADY (Formerly Stoney Point)

Chamber-All OAL Gauge - for bolt actions 39.95
Chamber-All OAL for semi-autos & levers 46.95
Modified Case for above: ..... series A - 6.50; series B - 7.50; 6 PPC .261 - 8.50
Bullet Comparator - requires insert 14.95
Comparator Insert - specify caliber 4.50

COOPER ARMS - Northwest Preferred Dealer.

Please call for pricing

LAPUA BRASS, per 100 pieces

.223 match	46.00	.220 Russian	72.00
.243	66.00	6BR	62.00
.308	55.00	30.06	80.00
6.5x47	82.00	6.5/284	94.00

SCOPES Lightforce, Weaver, Sightron, Leupold .... Call

HARRELL'S PRECISION

Full Length Resize Die, BR or PPC 70.00
Reloading Press, spec. PPC, .308, or Mag. 160.00
Combo Reloading Press 275.00
Powder Measure: ..... BR Prem (60 gr.) - 220.00
Premium (120 gr.) - 245.00; Custom (90 gr.) - 180.00

VISA DISCOVER MasterCard

PRO-SHOT

100% Cotton Flannel Patches, 500 per bag
3/4" square, .17 caliber, 5.25; 1" rd (600 ct) 9.95
1-1/8" square, .22 caliber 6.25
1-3/8" square, 6-7mm (1000 ct.) 10.95
1-3/4" square, 6mm through 30 caliber 7.75
2" round, .30 through .38 caliber 8.75
2-1/4" square, .38 through .45 (250 ct.) 5.95
Spear Point Jags, use with brush adapter on Dewey rods, specify .17, .22/6mm, .25, 6.5, 7mm, .30, .338 .... 3.50
Action & Chamber Cleaning Kit 17.95

TULLER/PROTEKTOR SANDBAGS

No. 1 Front Hunting Rifle 16.50
No. 2 Front, 2-1/2" wide forearm (varmint) 16.50
No. 3 Front, 3" wide forearm 16.50
Rear Bags - specify bunny or rabbit ears ..... standard model 24.50; thick base 32.50
..... custom, 1" higher, all heavy-duty 41.95
Brick Bag for elbow comfort ..... Lg. 18.50, Sm. 15.50
New Bumble Bee bag ..... from 62.95

NOW STOCKING
B.A.T. ACTIONS
Our complete inventory listed on the web at Benchrest Central Classifieds

JEWELL TRIGGERS

Standard BR ..... 1.5 oz - 165.00; with bolt release - 175.00
HVR Hunter Varmint 165.00
Options for HVR:
Bottom Lever Safety 25.00
Top Lever Safety 35.00
Left Hand Safety ..... Add 25.00
Bolt Release 10.00
Model 70 ..... 210.00
AR15 Trigger - spec. small or large pin 190.00

HAYDON EXCLUSIVE
5mm/35 SMc Brass by Norma $85.00/100
Lee 2-Die Full Length Set $85.00

K & M

Master Flash Hole Deburring Tool - specify .17, .20, standard or PPC 9.50
Professional Flash Hole Deburring tool - specify standard or PPC 14.50
Primer Seater Tool - specify cartridge 39.95
Tapered Case Mouth Reamer, spec. small or large . 24.00
Micro-adjustable Neck Turner, Std. - specify cart. ... 60.00
Extra Mandrels for Neck Turner - specify .17, .20, .22, 6mm, .25, 6.5, .270, .284, .30, or .338 ..... 9.00
Expander Die for Neck Turner, specify caliber 15.00
Fluted Neck Turner Mandrel - spec. cartridge 37.25
Neck Turner Pilot Jack 12.95

SOLVENTS & OILS

4 oz. Solvent Dropper Top Bottle ..... 2.95 or 3/8.50
Bore Tech Eliminator ..... 4 oz - 11.95; 16 oz - 21.95
Butch's Bore Shine Solvent, ... 4 oz. - 6.95; 16 oz. - 18.50
Butch's Bore Oil, 4 oz. 6.95
Imperial Sizing Die Wax, 2 oz. 5.95
IOSSO Bore Cleaner 6.50
JB Bore Paste or Bore Bright 7.50
USP Bore Cleaner 6.50
Kroil ..... 8 oz. can 6.95; gallon 49.95
Shooters Choice ..... 2 oz., 4.25; 4 oz., 6.95; 16 oz., 18.95
S.C. Rust Prevent Spray 5.95; Gun Grease 4.25
Shooters Choice Quick-Scrub III, 18 oz. spray 6.95
NEW Slip 2000 Carbon Killer, 16 oz. 13.95
Sweets 7.62, Copper Remover, 8 oz. 8.75
Wipe Out Bore Cleaning Foam, 5 oz. 11.95

REDDING - Full Line Distributor

Powder Measure 3BR 136.95; BR30 161.95
RS-2 Scale 70.95
Carbide Expander Kit - specify caliber 21.95
Competition Seater or Neck Die ..... cat. I 87.95; cat. II 105.95; cat. III 130.95
Full Length Die Sets from 37.95
Bushing-style FL or Neck Die ..... cat. I 45.95; cat. II 55.95; cat. III 68.95
Titanium Coated Bushing 19.50
Empty Bushing Box, holds 15 ..... 3.50
NEW Micro-adjustable Case Trimming Lathe 137.95

OTHER ACCESSORIES

6" Dial Caliper.... 26.95; Electronic Digital Caliper ... 39.95
Tubing Micrometer, .22 & up 49.95
Adjustable Shooting Stool, round top, the best 99.95
AR-15 Chamber Cleaning Kit 15.95
BAT ADL Style trigger guard, machined aluminum ... 35.00
Berger, Sierra, Bishop, Barts & Hornady Bullets ..... Call
Bulk Brass ..... Call
Butch's Triple Twill Patches:
1 1/8" or 1 1/2" (1000 ct) or 2 1/4" (500 ct) 10.95
1 3/4" (750 ct) or 2 1/2" (375 ct) 10.50
3" (300 ct) 8.95
Dunrud Sighter Cam 95.00
Dunrud Rear Bag Stabilizer, rubber 19.95
Fore End Stabilizer, fits 3" front bag 19.95
Hart Front Rest, JB 100 w/owl ear bag 125.95
Varmint w/owl ear bag 189.95
Competitive I 233.95
Pedestal only 159.95
Kelbly Scope rings, 1" single - 68.00, 1" double - 77.00 30mm single - 77.00, 30 mm double - 88.00
Kleinendorst Bolt Disengagement Tool ..... from 26.95
Krazy Kloth, to polish brass 3.95
Lee Auto-Prime, ... 2 trays-15.95, extra shellholder - 3.50
Leupold Rings & Bases ..... CALL
MTM 50 Rd. Ammo Box - specify cartridge 2.95
Official Targets - benchrest .... 100 or 200 yd, 2.25/doz; 300 yd, 4.95/doz
hunter ..... 100 or 200 yd, 3.25/doz
Rem Bolt Shroud, aluminum or anodized 18.95
Remington ADL style Trigger Guard, alum. 27.50
Rifle Basix Triggers: Rem, Sav, Ruger or Win ..... CALL
Sako-style Extractor Kits .222, 308, or magnum 25.95
Shilen Select Match Barrel 6mm, 1-14 ..... 239.95
Siebert Mini Bore Scope 31.95
Silicone Bag Spray, 4 oz. 5.95
Sinclair Bullet Comparator 17.95
Socket Head Guard Screw Set, Rem 700 BDL 5.95
Stand for Windflag: ..... Std -32.95; heavy duty - 52.95
Stock Tape, enough for 2 rifles 7.95
Whitetail Match Prep Primer Pocket Uniformer: spec lg rifle or sm rifle/pistol or Lapua 25.95
"The Ultimate in Rifle Accuracy", Glenn Newick 11.95
"The Varmint Hunters Odyssey", S. Hanson 37.95
".17 Caliber Shooting", spiral bound, Saunders 23.95
"Extreme Rifle Accuracy," softbound Mike Ratigan .. 37.95
Heavy Sand, 15 lbs. 18.75
BAT Action ..... Call
Win 52 (5 shot) or Rem 513 (10 shot) replacement magazines ..... 14.95 + 15.95
NEW Shadetree Engr. Coaxial Rest Top 375.00

ORDERING INFORMATION

Order by telephone, fax, internet or mail. If ordering by mail, include money order, check or VISA/MasterCard/Discover information (including expiration date and 3-digit security code) with order; no cash. For prepaid orders include ample funds for shipping; excess will be refunded with your order. Delivery will be via UPS ground service or postal service. Next Day, Second Day, or 3-Day delivery available at additional cost. Buyer pays fee on COD orders. Prices subject to change without notice due to manufacturers increase. International inquiries welcome. No international C.O.D.

COMPLETE CATALOG FREE UPON REQUEST

NOW on the web at: www.shooters-supply.com

BY M.L. McPHERSON

Synopsis: When considering fine hunting gun and chambering combinations that the gun press has more-or-less ignored, the 35 Remington Model, 336 Marlin should probably be near the top of any list. This combination is both handy and effective. It does not seem that any reasonable person could dispute the value of the Marlin 336 as an effective tool in the hands of most big game hunters in most situations. When considering ballistics, with typical loads, 35 Remington performance surpasses 30-30 performance. With best modern factory loads or optimum handloads, it is adequate and appropriate for use against all but the largest species, worldwide.

A friend, Gary Wagner, recently bought this used rifle; he fell in love with it. After doing preliminary load development, proving that it was just as accurate as it was pretty, he decided that he did not need to keep another Marlin, so he offered it to me. Knowing Wagner's high standards, I also knew that he would not be offering me the gun if it were not very special. Now, I must figure out how to afford to keep it because I certainly cannot sell it!

HISTORICAL PERSPECTIVE

In 1895, when Winchester standardized the 30 WCF (now universally known as the 30-30), which launched a 165-grain jacketed-soft-point bullet at about 1950 f/s, it started a revolution. This happened because the classic lever-action rifle was so handy and because the new chambering was generally effective on smaller species of North American big game.

However, the fact that Winchester soon introduced the 32 Special, which was loaded with a slightly heavier bullet at somewhat higher velocity and thereby generated about 15% greater muzzle energy, suggests that hunters had discovered that the 30-30 had limitations. (While the 32 Special offered a useful increase energy advantage, marketing and manufacturing mistakes prevented that chambering from ever achieving anything greater than modest acceptance.)

In 1906, Remington introduced the Model-8, a self-loading rifle that was chambered for 25-, 30-, and 32-caliber rimless versions of the standard Winchester lever-action chamberings (all based upon the 30-30 case). This was an obvious effort to compete with the handy and well-accepted lever-action rifles offered by Marlin, Savage, and Winchester.

Evidently, Remington believed the chamberings were key to what made those lever-action "deer" rifles so successful. Remington was wrong, what made those guns so successful was how handy they were to carry and how easy to use. The model-8 was nowhere nearly as handy and it, therefore, never approached the success of the various lever-actions with which it had been intended to directly compete.

Remington also created the 35 Remington, for introduction with the Model-8. This significantly more powerful chambering was certainly a step in the right direction.

Marlin eventually recognized the value of the 35 Remington chambering and has offered it in its 336 since just after World War Two. Had it not done so, it seems likely that this cartridge would have become obsolete long ago. Winchester might well have offered it in the Model-94 but that action design is less amenable to rimless cartridges.

It is rumored that Winchester came close to standardizing the popular wildcat, 35-30 at about that time. Likely, the poor success

of the 32 Special was a consideration in its not having done so. This is too bad because for several decades after World War Two there existed serious demand for a more powerful Winchester '94 chambering — gunsmiths performed many expensive wildcat conversions. By the time Winchester got around to answering that call, the lever-action was losing favor and the decades-too-late attempt (with the 307 and 356 Winchester chamberings, circa 1983) failed to gain significant favor.

35 REMINGTON BALLISTICS

Original 35 Remington factory loads launched 200-grain bullets at about 2050 f/s and therefore produced about 25% more muzzle energy than 30-30 loads of that era. However, for completely obscure and incomprehensible reasons, through subsequent decades, factory ammunition manufacturers approached the loading of these two cartridges with diametrically opposite philosophies. One the one hand, manufacturers continued to take advantage of advances in propellant technology to load the 30-30 at essentially identical pressure and thereby to offer ever-improved factory-load ballistics; on the other hand, the same manufacturers used ever-improved propellants to load the 35 Remington at the same (or even lower!) performance level but with ever-decreasing chamber pressure. For this reason, as decades passed, difference in muzzle energy between best (factory) 30-30 and 35 loads narrowed toward insignificance.

Many experienced hunters argue that even when loaded to generate similar muzzle energy, the 35 still has significant advantages in bullet weight and frontal area and is, therefore, more effective. I would not dispute this.

Recently, Federal has begun to turn this situation around. Best current standard 35 Remington factory loads launch 200-grain bullets at about 2200 f/s and therefore, significantly exceed performance of any factory 30-30 loading. If anyone were to ask me, I would suggest that it is long past time to establish a 15% greater, +P, pressure specification for the 35 Remington; this would allow loads at the same pressure as modern 30-30s. Such 35 Remington loads would generate about 100 f/s more velocity, a worthwhile improvement.

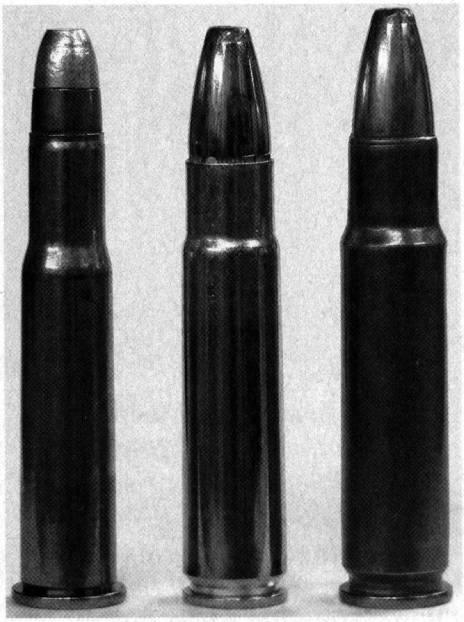
Buffalo Bore (a custom commercial ammunition manufacturer) now offers 35 Remington ammunition that takes full advantage of existing SAAMI pressure specifications and modern propellants. For example, it

Continued on next page

Ballistics Comparison of 30-30 Winchester and 35 Remington (200-yard zero)

	Bullet	Range	Muzzle	50	100	150	200	250	300
30-30 Winchester	150 Speer FP	Velocity	2500	2367	2238	2113	1993	1876	1763
		Energy	*2082*	*1866*	*1668*	*1488*	*1322*	*1172*	*1035*
		Path	-1.3	+1.6	+2.9	+2.4	0.0	-4.5	-11.5
	170 Speer FP	Velocity	2300	2191	2085	1982	1882	1784	1691
		Energy	*1997*	*1812*	*1641*	*1483*	*1336*	*1201*	*1079*
		Path	-1.3	+2.0	+3.3	+2.7	0.0	-5.2	-13.3
35 Remington	180 Speer FP	Velocity	2450	2308	2170	2038	1910	1786	1669
		Energy	*2399*	*2128*	*1883*	*1660*	*1458*	*1275*	*1113*
		Path	-1.3	+1.7	+3.1	+2.6	0.0	-4.9	-12.7
	220 Speer FP	Velocity	2200	2093	1989	1888	1789	1695	1605
		Energy	*2364*	*2140*	*1933*	*1741*	*1564*	*1404*	*1259*
		Path	-1.3	+2.2	+3.7	+3.1	0.0	-6.0	-15.0

Data for loads using best propellants and generating SAAMI maximum pressure. Note that the currently accepted industry pressure limit for the 30-30 Winchester is 15% higher than for the 35 Remington. When loaded at the same pressure as the 30-30 loads shown here (which would certainly be reasonable for loads used in modern Marlin rifles), 35 Remington muzzle velocity would be about 100 f/s faster, giving it a large advantage in all respects.



The first smokeless-powder sporting cartridge offered, the 30 WCF (now universally known as the 30-30), left, was introduced in 1895. The 35 Remington, middle, was introduced in 1906. The original 35 Remington load generated about 30% more energy than the original 30-30 load. After decades of ballistic neglect, modern Federal and Buffalo Bore loads are once again allowing the 35 Remington to shine. The 356 Winchester, right, was introduced in 1983. It has never been factory loaded to take full advantage of the bolt-action pressure level that SAAMI specifications allow (such loads might cause extraction difficulties). Typical factory loads generate about 15% more energy than best SAAMI specification 35 Remington loads. However, when loaded to the same pressure, the 35 would launch any given bullet only about 25 f/s slower than the 356 (the 35 Remington case is lighter so it has almost as much capacity, despite the apparent difference in size).

Factory Loads tested. Left-to-right: Buffalo Bore 220-grain Speer FP — 2187 f/s; Federal 200-grain Soft Point RN — 2083 f/s; Remington 150-grain Core-Lokt Spitzer! — 2150 f/s; Winchester 200-grain Power Point RN — 1955 f/s.

If Remington would load its unusually efficient bullet to a reasonably brisk muzzle velocity (2400 f/s would still be a mild load!), its offering would be far more interesting. Likely this bullet has a BC that is within about 10% of matching the 200-grain Round Nose bullets used by Federal and Winchester. Likely, BC of the 220-grain Speer is about 20% higher.

One Special Marlin

Continued

offers the excellent Speer 220-grain Hot Core loaded at 2200 f/s (handloaders can easily duplicate this load). This far surpasses the energy of any 30-30 loading at normal SAAMI pressure.

Such loads come within 10% to 15% of matching 356 Winchester factory-load performance (250-grain bullets at about 2100 f/s). (When loaded to its full potential, the 356 will launch the 220-grain Speer FP at 2450 f/s.)

ACCURACY

I tested this rifle with a 2½ X Scout scope fitted with a European Duplex reticle, which significantly limited my ability to prove the intrinsic accuracy of the gun. Wagner's experience with a similar scope having a fine reticle proved the fine accuracy potential. If I were attempting to prove just how well this gun would shoot, I would fit a quality target scope and spend considerable time developing loads and testing those. That was not my purpose.

Generally, while difficult to shoot well from the bench, the Marlin 336 is capable of far better accuracy than many shooters realize. And, in any case, just exactly how much accuracy does one need in a rifle that will be used to hunt big game and that, due to trajectory and retained energy limitations, probably should not be used for shots beyond about 250 yards?

From what I have heard, 35 Remington chambered Marlins are perhaps among the most accurate of the genre. While this might be difficult for some bolt-action fans (elitists?) to accept, these guns routinely beat the MOA accuracy "standard." As the included pictures of test groups clearly demonstrate, accuracy of this Marlin far surpasses what is actually needed for any reasonable big game hunting application.

I suspect that the relatively slow, sixteen-inch, twist rate of the 35 is at least partly responsible for the oft' reported exceptional accuracy. Chris Dichter, Pac-Nor Barreling, has done twist-rate comparisons in traditional lever-action rifles. He showed that these guns are unusually sensitive to twist rate and are routinely significantly more accurate with a barrel that has the slowest feasible twist.

These results represent what I saw with this gun during very limited load development, where I was more interested in velocity than in accuracy. I suspect that with further load development work, and a target-type scope, I could prove better accuracy; however, other than demonstrating

Precision Press for 50 BMG or standard calibers...

The ***Mega-Mite***™ bullet swaging/reloading press has lab-quality alignment in a dual-stroke 70-lb roller-bearing, steel framed powerhouse. Swages up to 4-bore lead or jacketed bullets! Many available accessories...

Free info on-line at www.SwageDies.com

CORBIN

PO Box 2659, White City, OR 97503

Phone 541-826-5211 Fax 541-826-8669

www.Corbins.com sales@Corbins.com

Left to right: Bear Creek Supply 180-grain TC; Speer 180 FP Hot Core; Speer 220 FP Hot Core; Mount Baldy 225 SWC; Mount Baldy 240 WFN. Each is useful and this selection would cover any feasible application for anything from plinking to vermin to moose, including <u>most</u> African species.

the "potential accuracy" point, such an investment would be of little value in this instance.

Many years ago, a ***PS*** *reader looked me up at the Kansas City NRA Convention; he wanted to apologize for doubting my lever-action accuracy reports in these pages. He had assumed that most of my groups were, "... fired at the typewriter." As he explained, "... so, one day, as I loaded up my gear to head to the range, I grabbed my scoped Marlin [a 35 Remington] and a box of Remington factory loads. I fired four, five-shot groups at 100-yards. Average center-to-center spread was less than four-tenths inch!"*

It goes both ways, I would love to ask the author of a piece wherein the claim was. "...4-MOA accuracy is about as good as anyone can expect from a typical lever-action rifle..." just exactly how he came to that phenomenal conclusion!

WHY THIS GUN IS SPECIAL

As I tried to show in the associated pictures, the wood on this gun is far better than average; while it is probably not quite "presentation grade" (it is impossible to tell without stripping and refinishing it because the factory plastic finish hides almost all color and masks grain structure), despite this, it is strikingly pretty. Equally, metal finish and wood-to-metal "fit" are better than average. Moreover, this action is unusually smooth for a factory Marlin. Finally, this gun is accurate! Regardless of chambering, this would be a very special gun. As a package, this gun is special, any way I consider it.

While the 35 Remington Marlin 336 has always intrigued me, it took me the better part of a lifetime to finally own one. This gun, manufactured in 2004, has made doing so worth the wait.

My single complaint with this gun was the trigger. Factory let-off was 6½ pounds, which is far

Continued on next page

35 REMINGTON TESTED AND PLANNED TEST LOADS; PRIMER, CCI 300

TESTED FACTORY LOADS						
Manufacturer		Bullet		f/s | S.Dev. f/s min-max	Accuracy (in)	Comments
Remington		150 CL RN		2150 | 31	1.5	
Federal		200 SP RN		2083 | 12	0.8	Impressive!
Winchester		200 PP RN		1955 | 16	2.5	
Buffalo Bore		220 Speer FN		2187 | 26	2.0	Serious power
TESTED JACKETED-BULLET LOADS						
Case Capacity	Bullet	Propellant	Charge	f/s | S.Dev. f/s min-max	Accuracy (in)	Comments
R-P 52.5	180 Speer FP	H322	41.5	2504 | 8	3.0!	
			42.0	2524 | 11	1.5	SAAMI Maximum psi
			42.5	2517 | 6	1.4	Too compressed?
W-W 51.1		*H4895	*42.5*	*2290-2302*	*0.587*	*Wagner Test*
R-P 52.5		VarGet	42.5	2163 | 20	2.4	
			43.5	2214 | 17	2.2	Case full
	220 Speer FP	H322	38.0	2173 | 5	--	Missed above paper
			38.5	2216 | 9	2.5	
			39.0	2244 | 10	2.3	SAAMI Maximum psi
W-W 51.1		*BenchMark	*38.0*	*2114-2146*	*0.272*	*Wagner Tests*
			38.5	*2142-2146*	*0.252*	
			39.0	*21666-2172*	*0.197*	
		*H4895	*39.5*	*2060-2091*	*0.157*	
			40.5	*2133-2164*	*0.152*	
R-P 52.5		VarGet	40.0	2015 | 18	1.2	
			40.5	2036 | 16	1.9	Too compressed?
PENDING JACKETED-BULLET TEST LOADS						
R-P 52.5	250 ABW SNFN	H322	Charges from 36.6 to 38.1 grains			Test for, velocity, accuracy, and consistency
		A2495	Charges from 39.0 to 40.5 grains			
TESTED CAST-BULLET LOADS						
F-C 50.2	180 BCS TC**	N310	6.0	1100 | 6	0.4	25-yard, 5-shot groups. Exceptionally clean, quiet, minimal recoil.
			6.4	1143 | 1	0.3	
			6.9	1193 | 8	0.35	
			7.3	1233 | 7	0.3	
W-W 51.1	200 RN	*VarGet	29.5	1960-1979		Wagner Test — see note 1
PENDING CAST-BULLET TEST LOADS						
R-P 52.9	225 SWC	A2495	Charges from 37 to 40 grains			Test for, velocity, accuracy, and consistency
	240 FN		Charges from 36.5 to 39.5 grains			280 might not stabilize at sea level on a cold day.
	280 FN		Charges from 34.5 to 27.5 grains			

* These loads: Accuracy and velocity results based upon limited testing at 50 yards, 5-shot groups fired using a fine reticle Scout scope with 2 1/2 X magnification. All other data represents average of four, five-shot, one-hundred-yard groups.

Note 1: On four trips to the range, Wagner fired five-shot groups at 50-yards with this combination. Every group was one ragged hole.

Velocity: Corrected to muzzle from 22-inch barrel data. For MV, add to IV (15-feet data) 14 f/s for 180, 18 f/s for 200, 22 f/s for 225, 11 f/s for 220, 18 f/s for 240, and 15 f/s for 280.

Sights: Wagner, 2 1/2 X IER Leupold with standard Duplex reticle; McPherson, 2 1/2 X IER Leupold with custom heavy Duplex reticle (I suspect I could shoot significantly smaller groups given a high-magnification scope and a finer reticle — at least a one-half minute improvement seems likely.)

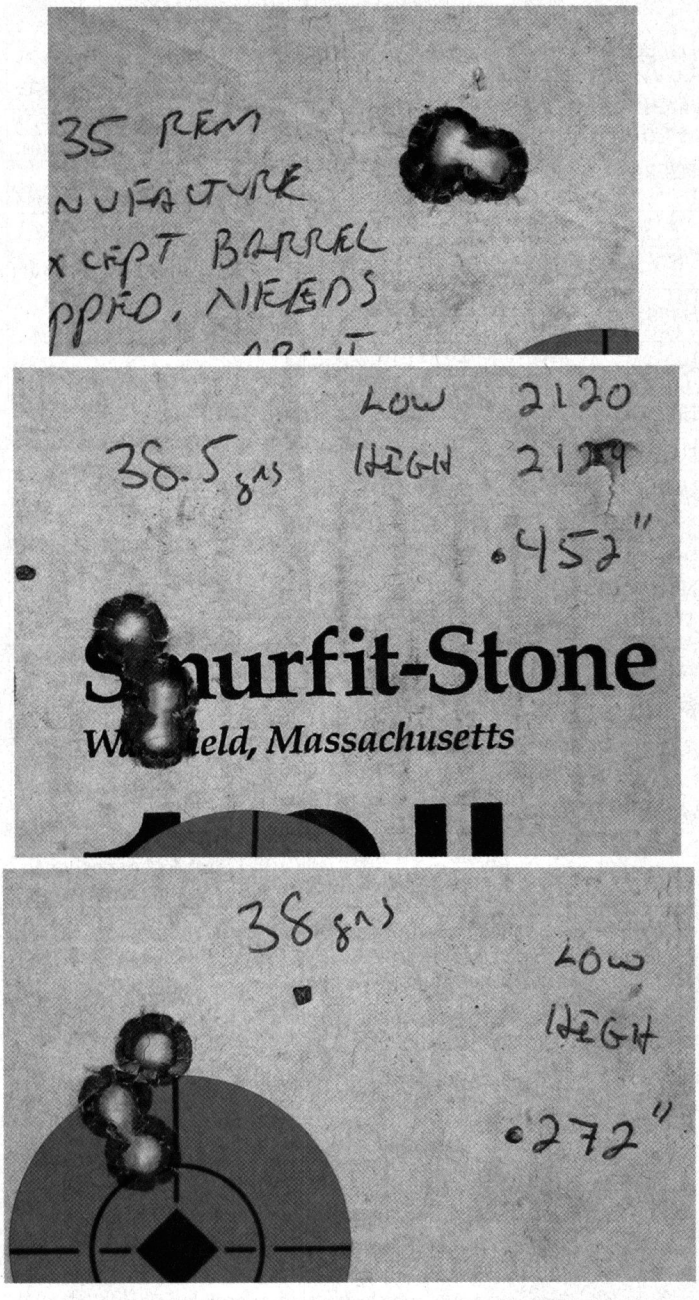
** Due to the short throat of this gun and the short ogive of the BCS bullet, it was necessary to seat at the forward crimping groove, which gave an overall length of 2.22 inches — despite this limitation, cycling was perfect but it was necessary to squeeze the finger-lever firmly to engrave the rifling into the protruding portion of the bullet shank.

Dies: RCBS, Full-Length and Seating; Lyman, Type-M Expander; Lee, Factory Crimp. In the past few years, RCBS has made large strides in product quality; these dies were no exception. The Type-M is always a good idea when using cast bullets. The Lee FCD produces the best crimp possible for any load used in any lever-action rifle chambering.

One Special Marlin

Continued

heavier than I prefer. So, I fitted the excellent Wild West Guns trigger with a Brownells hammer spring. Without any other changes, this reduced let-off to a very crisp 3 pounds. After whittling on the trigger spring, let-off was 2½ pounds, which I can certainly live with; if not, experience has shown that a bit of judicious polishing on the sear notch will allow for a significantly lighter let-off. (Editor: The writer is virtually a gunsmith. Amateurs should keep their noses out of trigger improvements.)



Anyone who does not believe a lever-action rifle can be accurate enough for varminting should consider these groups, fired by Wagner at 50-yards. Practically every group he fired was similar. H4895 would appear to be the accuracy choice for the 35 Remington with jacketed bullets.

SPECIAL HANDLOADING CONSIDERATIONS

Over the years and from one manufacturer to the next, capacity of 35 Remington cases has varied rather significantly.

Obviously, variations in case weight and resulting usable capacity suggests the prudence of caution when handloading. For example, when using faster propellants (where normal, full-pressure loads are not significantly compressed), a load that generates 40,000 psi when used in a recent Remington case would generate about 44,700 psi when loaded in a recent Federal case.

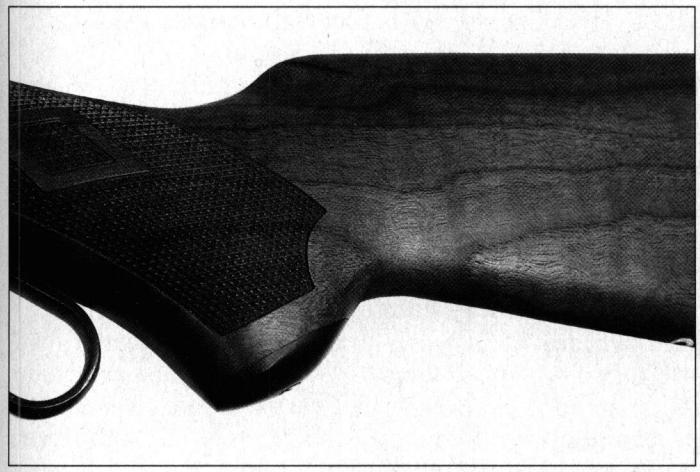
As an interesting aside, consider the ballistic difference between the 35 Remington and the 356 Winchester. When loading each at the same pressure (in my opinion, doing so would not be unreasonable for cartridges specifically for use in a modern — post 1975 — Marlin) and when using Remington cases for the 35 Remington, muzzle velocity difference would not exceed 25 f/s! It would seem that rechambering a 35 Remington to 356 (or 358) would be a rather unproductive enterprise.

In my opinion, all 35 Remington loads for use in a Marlin should use standard large-pistol primers — due to the relatively low striker energy, softer primers give more uniform ballistics and such modest charges of easily ignited propellant simply do not require rifle primers. I suspect that the CCI-300 is the best choice. Avoid Federal pistol primers because those have unusually soft cups. If cratering is observed or if the use of pistol primers makes you nervous in this application, I suggest the CCI-BR2 (improved uniformity

Continued on page 30

Characteristics of 35 Remington cases
(Data gathered through an informal survey):

Make	Weight	Decade Made	Water Capacity (grains)
Remington	147	2000	52.5
R-P nickel-plated	144	1990s	52.9
Rem-UMC	156	1950s	51.6
Winchester	160	2000s	51.1
	150	1950s	52.2
Peters	145	1940s	52.7
Federal	167	2000	50.2
	151	1970s	52.2
	160	1980s	51.1

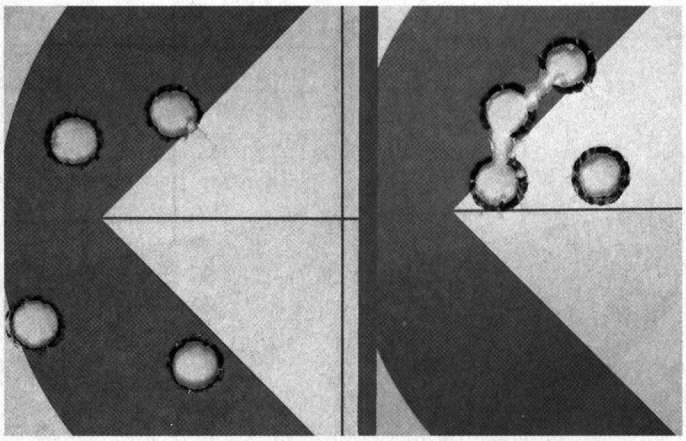


Without refinishing — to remove the plastic factory finish, which does a phenomenal job of hiding any color and most grain structure — it is impossible to know just how beautiful this wood is; in any case, no picture can ever show the depth of beauty of good Black Walnut. This stock has significant color and a surprising amount of "fiddleback."

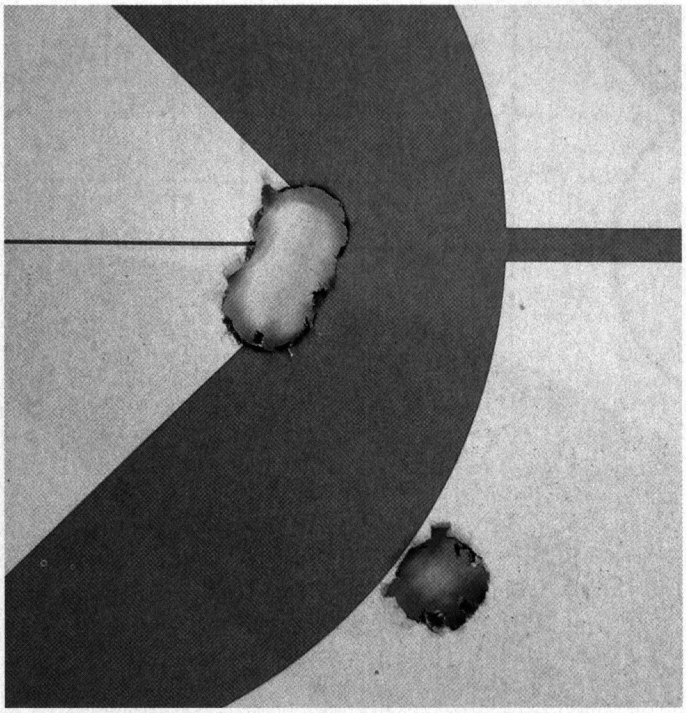
I found these RCBS dies to be useful and of top quality. The FL and seating dies proved to have superb quality, as is typical of modern RCBS dies.

The Lyman M-type (not shown) opens the case neck to the ideal diameter for typical cast bullets and is adjustable to open a short portion at the mouth to just larger than bullet diameter, which allows for easy bullet starting — the bullet sits squarely in the case before and during seating.

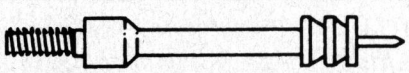
The Lee FCD (not shown) produces an ideal crimp that leaves no sharp edges that could easily damage (scrape) the bullet during firing — rearward extent of crimped section is bent, leaving a smooth, polished surface and the mouth is not folded inward, so no sharp edge presents to the bullet surface.



Gun shot very well with Federal factory ammo, (right); other brands shot good enough for big game hunting but were otherwise unimpressive, as represented by group at left — typical 100-yard groups.



I saw something similar to this often enough to lead me to suspect that I could significantly improve accuracy of this gun by properly bedding the stocks and adding a throughbolt to the buttstock.



SPEAR POINTED CLEANING JAG

PRO-SHOT PRODUCTS

Manufacturer of Gun Cleaning Supplies for Accuracy

100% Cotton Flannel Patches (Finished Both Sides for *Extra Absorbency)* - Brass Core/Bronze Bristle Bore Brushes-Jags-Bore Guides-Cleaning Rods-Action Tools-Bore Mops-Bore Solvents-Bolt Lube-Complete line of Cleaning Accessories. Send for *Free Catalog-Dealer Inquiry Invited, Pro-Shot Products,* Box 763, Taylorville, IL 62568. PH: (217) 824-9133 - FAX (217) 824-8861.

www.proshotproducts.com

One Special Marlin

Continued from page 28

of these primers is apt to give better ballistic uniformity in the Marlin with its relatively light striker impact).

When working with any tubular magazine rifle that generates significant recoil, I prefer loads where bullet seating significantly compresses the charge. This reduces (essentially eliminates) the potential for recoil to drive bullets into cases in rounds in the magazine. H322, BenchMark, A2495, IMR4895, and H4895 are fine choices. For those interested in top-end loads, for use only in strong, modern guns, H322 is probably the best choice.

In standard 35 Remington loads, hunters interested in expanding bullets will never need anything other than the Speer 180- or 220-grain Flat Point. These Hot Core bullets have very impressive BCs (0.240 and 0.301, respectively) and, when used with normal 35 Remington loads, terminal performance is comparable to that of the best premium hunting bullets. For top-end loads at higher than standard 35 Remington pressure, Alaska Bullet Works offers a bonded-core 250-grain bullet that will provide maximum terminal performance — double caliber expansion and practically 100% weight retention! For applications where a non-expanding bullet is preferred, Mount Baldy and other companies offer excellent heavy cast bullets that can be used at full pressure to give as much muzzle energy as any similar jacketed bullet.

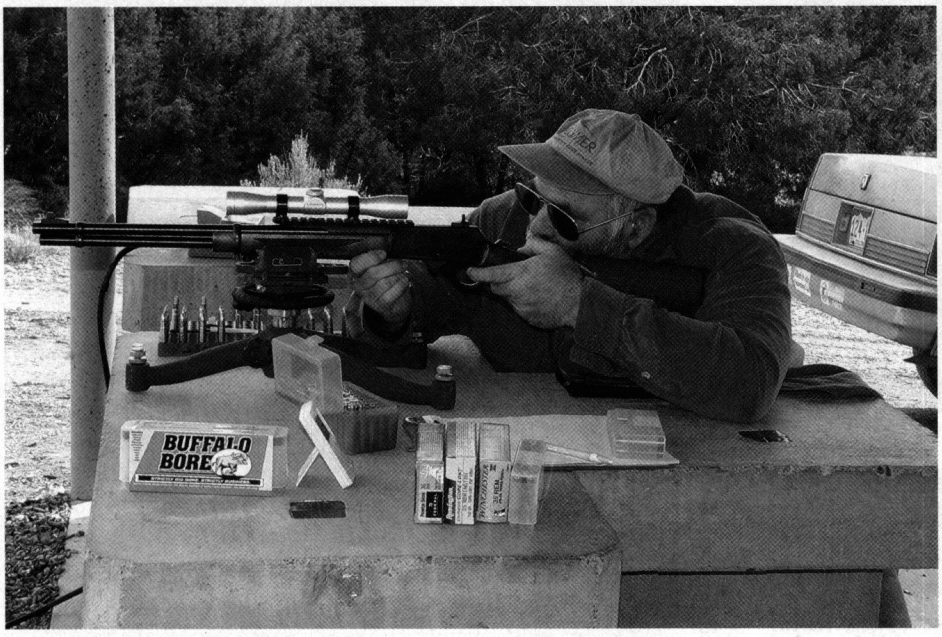
CONCLUSIONS

Those interested in a rifle for use in hunting most species of North American game, and many similar species world wide, will find that, with the right loads, the Marlin 336 in 35 Remington is a handy and capable combination. While inappropriate for shots beyond about 250-yards (even with best bullets and loads, limitations of trajectory and retained energy quickly mount), this combination is fully adequate for most hunting situations and most species.

Is the 35 Remington better than the 30-30? Well, I must conclude that in every category excepting recoil, the 35 has a significant edge. Those who are only interested in using top-end loads and who are particularly sensitive to recoil will find the 30-30 a better choice because shot placement always trumps delivered energy and, for most of us, a gun that generates less recoil is easier to shoot accurately.

Handloaders will find that the 35 Remington offers significant advantages. For example, availability of myriad inexpensive cast and jacketed 357 Magnum bullets for plinking (the 35 is a fine cast-bullet cartridge). And, as noted, sufficient jacketed bullet choices exist to cover any big-game hunting application.

After more than one century of serving hunters well, perhaps the 35 Remington can finally begin to receive the recognition it deserves. Introduction of mainstream +P factory loads to follow the lead of Buffalo Bore would certainly encourage that development.



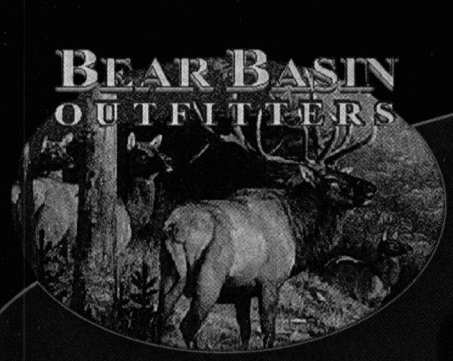
Despite significant limitations of a 2½ X scope with an unusually heavy Duplex reticle (European style), this gun was a pleasure to shoot from the bench. This Leupold Scout scope with QRW Leupold rings on the XS Systems Scout Scope base makes a fantastic combination for serious hunting. The back-up XS Systems aperture and post system is equally useful.

Top-end loads generated all the recoil I wanted and it became obvious that I need to install a quality recoil pad, this will give me a reason to refinish the stock with hand-rubbed Tung Oil, which will bring out the natural beauty — rather than hiding it, as the factory finish does.

Mt. Baldy Bullet Company
PO Box 835
Cody, WY 82414
Telephone: 307-754-5255

Bear Creek Supply
P.O. Box 177
Waterford, CA 95386
Telephone: 209-874-4322

Alaska Bullet Works
9978 Crazy Horse Drive
Juneau, AK 99801
Telephone: 907-789-3834



BEAR BASIN OUTFITTERS

Free Shipping in the Continental U.S. on Any Order Over $250!!

All Items Available for Immediate Shipment

BEAR BASIN OUTFITTERS

Premium Quality . . . Great Prices!!

1-800-641-4470

We carry a full line of many brands of binoculars and spotting scopes — too many to list!!

BURRIS

Fullfield II

3-9X 40mm Gloss/Matte Plex.....$179
3-9X 40mm Matte Ballistic Plex (incl. binoculars).....$199
3-9X 40mm Matte Ballistic Plex LRS III. $319
3-9X 40mm Matte Electro Dot $299
3-9X 50mm Matte Ballistic Plex.....$279
3.5-10X 50mm Matte Plex $299
3.5-10X 50mm Matte Ballistic Plex.....$319
4.5-14X 42mm Gloss Plex AO.....$319
4.5-14X 42mm Matte Plex AO.....$329
4.5-14X 42mm Matte Fine Plex AO.....$329
4.5-14X 42mm Matte Ballistic Plex AO (incl. spotter).....$349
6.5-20X 50mm Matte Fine Plex AO.....$379
6.5-20X 50mm Matte Ballistic Mil-Dot AO $449

Signature Select Series

3-10X 40mm Matte Ballistic Plex.....$399
3-10X 40mm Matte Ballistic Plex Posi-Lk.....$399
3-12X 44mm Matte Ballistic Plex.....$419
3-12X 44mm Matte Ballistic Plex Posi-Lk.....$439
4-16X 44mm Matte Ballistic Plex AO.....$469
4-16X 44mm Matte Ballistic Plex Posi-Lk AO.....$519
4-16X 44mm Matte Ballistic Mil-Dot AO $539
6-24X 44mm Matte Plex AO.....$489
6-24X 44mm Matte Target Fine Plex Tgt AO.....$499
6-24X 44mm Matte Ballistic Mil-Dot Tgt AO $569
8-32X 44mm Matte Fine Plex Tgt AO.....$506
8-32X 44mm Matte Ballistic Mil-Dot Tgt AO $579

Black Diamond (30mm Tube)

4-16X 50mm Matte Plex SF $599
4-16X 50mm Matte Ballistic Plex SF $619
4-16X 50mm Matte Ballistic Mil-Dot SF.....$679
4-16X 50mm Matte Ballistic M-Dot Posi-Lk SF $719
6-24X 50mm Matte Fine Plex Target SF $665
6-24X 50mm Matte Ballistic Mil-Dot Tgt SF.....$749
8-32X 50mm Matte Fine Plex Tgt SF $695
8-32X 50mm Matte Ballistic Mil-Dot Tgt SF.....$792

ZEISS

Conquest

Free Express Shipping with All Conquest Scopes
Free Leupold Std. Ring/Bases
w/all 3-9x50 & larger scopes

3-9X 40mm Matte Z-Plex.....$449
3-9X 40mm Matte #4 .....$449
3-9X 40mm Silver Z-Plex.....$499
3-9X 50mm Matte #4 .....$549
3-9X 50mm Silver Z-Plex.....$649
3-9X 50mm Matte RapidZ 600 .....$624
3.5-10X 44mm Matte Z-Plex or #4 .....$649
3.5-10X 44mm Silver Z-Plex.....$699
3.5-10X 44mm Matte RapidZ 600 .....$724
3.5-10X 44mm Matte RapidZ 800 .....$724
3.5-10X 50mm Matte Z-Plex or #4 .....$699
3.5-10X 50mm Matte RapidZ 600 .....$774
3.5-10X 50mm Matte RapidZ 800 .....$774
4.5-14X 44mm Matte Z-Plex or #4 (SF) $749
4.5-14X 44mm Matte Mil-Dot (SF).....$799
4.5-14X 44mm Matte Mil-Dot (SF) Target.....$899
4.5-14X 44mm Matte RapidZ 800 (SF) $824
4.5-14X 44mm Matte RapidZ 1000 (SF) $824
4.5-14X 50mm Matte Z-Plex (SF) Target.....$799
4.5-14X 50mm Silver Z-Plex (SF) Target.....$849
4.5-14X 50mm Matte RapidZ 800(SF) $874
4.5-14X 50mm Matte RapidZ 1000(SF) Target $874
6.5-20X 50mm Matte Z-Plex (SF) Target.....$949
6.5-20X 50mm Matte Mil-Dot (SF) Target.....$999
6.5-20X 50mm Silver Z-Plex (SF) Target.....$999
6.5-20X50mm Matte RapidZ 1000 (SF) Target ...$1024
6.5-20X50mm Matte RapidZ Varmint (SF) Target$1024

All VM/V Models In Stock Call

Bushnell

Elite 3200

10X 40mm Matte Mil-Dot.....$199
1.5-4X 32mm Matte Plex w/Fire Fly Ret.....$209
2-7X 32mm Matte Plex $199
3-9X 40mm Gloss/Matte/Silver Plex.....$199
3-9X 40mm Matte Plex w/Fire Fly Ret.....$219
3-9X 50mm Gloss or Matte Plex.....$239
3-9X 50mm Matte Plex w/Fire Fly Ret.....$269
4-12X 40mm Matte Plex AO $269
5-15X 40mm Matte Plex AO $299
5-15X 50mm Matte Plex AO $309

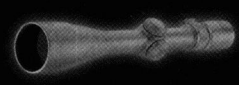
Elite 4200

2.5-10X 40mm Gloss, Matte or Silver Plex...$3469
2.5-10X 40mm Matte w/Fire Fly Ret.....$409
2.5-10X 50mm Matte Plex $449
4-16X40mm Matte Plex AO.....$379
4-16X 50mm Matte Plex AO $479
6-24X 40mm Matte Plex AO $419
6-24X 40mm Matte 1/4 Min Dot AO.....$419
6-24X 40mm Matte Mil-Dot AO.....$439
6-24X 40mm Matte Mil-Dot AO Side Focus...$519
6-24X 40mm Matte Mil-Dot (30MM) Side Focus ...$569
8-32X 40mm Matte Plex AO $479

Nikon Riflescopes

Buckmaster Series

3-9X 40mm Matte Plex.....$199
3-9X 40mm Silver Plex.....$209
3-9X 50mm Matte Plex.....$299
4.5-14X 40mm Matte Plex SF $279
4.5-14X 40mm Silver Plex SF $289
6-18x40mm Matte Plex SF Target.....$349
6-18x40mm Matte Target Dot SF Target $349



Monarch Series

2.5-10X42 Lustre (Nikoplex).....$379.95
2.5-10X42 Matte (Nikoplex).....$389.95
2.5-10X42 Matte (Mildot).....$399.95
2.5-10X42 Silver (BDC Reticle).....$409.95
2.5-10X42 Matte (BDC Reticle).....$399.95
2.5-10X50 Matte (Nikoplex).....$469.95
2.5-10X50 Matte (BDC Reticle).....$479.95
3-12X42 (Side Focus) Lustre (Nikoplex) $409.95
3-12X42 (Side Focus) Matte (Nikoplex) $419.95
3-12X42 (Side Focus) Matte (BDC Reticle).....$429.95
4-16X42 (Side Focus) Matte (Nikoplex) $439.95
4-16X42 (Side Focus) Matte (BDC Reticle).....$449.95
4-16X42 (Side Focus) Matte (Mildot).....$449.95
5-20X44 (Side Focus) Matte (Nikoplex) $519.95
5-20X44 (Side Focus) Matte (BDC Reticle).....$529.95
6-24X50 (Side Focus) Matte (Nikoplex) $629.95
6-24X50 (Side Focus) Matte (Fine Crosshair)..$649.95
6-24X50 (Side Focus) Matte (Fine Crosshair w/Dot).....$649.95
6-24X50 (Side Focus) Matte (BDC Reticle).....$649.95

Shepherd Scopes

All Reticles in Stock
Free set of Leupold std rings & bases & Express shipping

3-10X 40MM Matte All Reticles $625
6-18X 40MM Matte V1 Reticle..... $725
6-18X 40MM Matte V2 Reticle..... $725

LASER RANGEFINDERS

Leica

All Leica Geovid Models In Stock!
Leica CRF 900 (Black) -Yards-.....$549
Leica CRF 1200 (Black) -Yards-.....$649

Swarovski

Swarovski LaserGuide 1500.....$939
Leupold Rangefinders
RX-I Black 750 yds.....$237
RX-II Black 750 yds $299
RX-II Camo 750 yds $319
RX-III Black 1200 yds.....$399
RX-IV Black 1500 yds.....$479
RX-IV Camo 1500 yds.....$499

Bushnell

Elite 1500 RainGuard Rangefinder.....$359

NIGHT FORCE

ALL Reticle In Stock All orders get Free Express Shipping

NXS

1-4X 24mm SF (30mm Tube).....$1154
2.5-10X 24mm SF (30mm Tube).....$1325
3.5-15X 50mm SF (30mm Tube).....$1425
3.5-15X 50mm SF (30mm Tube) w. Zero Stop.....$1605
5.5-22X 50mm SF (30mm Tube).....$1568
5.5-22X 50mm SF (30mm Tube) w. Zero Stop.....$1748
3.5-15X 56mm SF (30mm Tube).....$1425
3.5-15X 56mm SF (30mm Tube) w. Zero Stop.....$1605
5.5-22X 56mm SF (30mm Tube).....$1568
5.5-22X 56mm SF (30mm Tube) w. Zero Stop.....$1748
8-32X 56mm SF (30mm Tube).....$1686
12-42X 56mm SF (30mm Tube).....$1829

BENCHREST

8-32X 56mm AO (30mm Tube).....$1211
12-42X 56mm AO (30mm Tube).....$1306

LEUPOLD

MARK RIGHT, MADE RIGHT.

All orders $299-$649 get free rings or bases
All orders over $650 get bore sighter or flip back covers
Free Express shipping on all VX-III Long Range and up scopes

VX-II

1-4X 20mm Matte Duplex.....$299
2-7X 33mm Matte Duplex.....$299
2-7X 33mm Matte LR Duplex $329
3-9X 40mm Gloss Duplex.....$299
3-9X 40mm Matte Duplex.....$299
3-9X 40mm Matte Wide Duplex.....$299
3-9X 40mm Silver Duplex.....$299
3-9X 40mm Silver Wide Duplex.....$299
3-9X 40mm Matte Leupold Dot.....$349
3-9X 40mm Matte LR Duplex $329
3-9X 50mm Matte Duplex.....$399
3-9X 50mm Matte Heavy Duplex.....$399
3-9X 50mm Matte LR Duplex $429
4-12X 40mm Matte Fine Duplex AO.....$429
4-12X 40mm Silver Fine Duplex AO.....$429
6-18X 40mm Matte Fine Duplex AO.....$479
6-18X 40mm Matte Fine Duplex Tgt AO.....$499
6-18X 40mm Matte Tgt Dot AO $529
6-18X 40mm Matte Tgt Dot Target AO $549
6-18X 40mm Matte LRV Duplex AO $509

VX-III

1.5-5X 20mm Gloss Duplex.....$399
1.5-5X 20mm Matte Heavy Duplex.....$399
1.75-6X 32mm Matte Duplex.....$399
1.75-6X 32mm Matte Heavy Duplex.....$399
2.5-8X 36mm Matte/Gloss Duplex.....$399
2.5-8X 36mm Matte Boone & Crockett.....$479
2.5-8X 36mm Silver Duplex.....$399
3.5-10X 40mm Gloss/Matte/Silver Duplex.....$479
3.5-10X 40mm Matte Boone & Crockett.....$559
3.5-10X 50mm Gloss Duplex.....$549
3.5-10X 50mm Matte Duplex.....$549
3.5-10X 50mm Silver Duplex.....$549
3.5-10X 50mm Matte Boone & Crockett.....$629
4.5-14X 40mm Matte Duplex non-AO $529
4.5-14X 40mm Matte Boone & Crockett non-AO ...$609
4.5-14X 40mm Matte Duplex AO.....$549
4.5-14X 40mm Matte Fine Duplex AO.....$549
4.5-14X 40mm Matte Boone & Crockett AO.....$629
4.5-14X 40mm Matte Varmint Hunters AO $629
4.5-14X 50mm Matte Duplex non-AO $599
4.5-14X 50mm Silver Duplex non-AO $599
4.5-14X 50mm Matte/Silver Boone & Crockett.....$679
4.5-14X 50mm Matte/Silver Varmint Hunters $679
4.5-14X 50mm Matte Long Range Illuminated Boone & Crocket $879
6.5-20X 40mm Matte Fine Duplex EFR Tgt AO $669
6.5-20X 40mm Matte Target Dot EFR Tgt A.....$719

VX-L

3.5-10x 50mm Matte (1") Duplex.....$699
3.5-10x 50mm Matte (1") Boone & Crockett.....$779
4.5-14x 50mm Matte (1") Duplex.....$779
4.5-14x 50mm Matte (1") Boone & Crockett.....$859
4.5-14x 50mm Matte (1") Varmint Hunters $859
3.5-10x 56mm Matte (30mm) Duplex.....$879
3.5-10x 56mm Matte (30mm) German #4 .....$929
3.5-10x 56mm Matte (30mm) Boone & Crockett ...$959
4.5-14x 56mm Matte (30mm) Duplex SF $979
4.5-14x 56mm Matte (30mm) Varmint Hunters SF $1059
4.5-14x 56mm Matte (30mm) Boone & Crockett SF.....$1059
6.5-20x 56mm Matte (30mm) Fine Duplex SF $1079
6.5-20x 56mm Matte (30mm) Target Dot SF $1099
6.5-20x 56mm Matte (30mm) Varmint Hunters SF $1129

Illuminated VX-III

1.5-5X 20mm Matte Duplex.....$579
1.5-5X 20mm Matte German #4 Dot $579
1.5-5X 20mm Matte Circle Dot $579
3.5-10X 50mm Matte Duplex.....$729
3.5-10X 50mm Matte German #4.....$729
4.5-14X 50mm Matte Fine Duplex.....$879
4.5-14X 50mm Matte German #4 Dot $879

VX-III Long Range (30mm Tube)

4.5-14X 40mm Matte Fine Duplex SF $599
4.5-14X 50mm Matte Duplex SF $699
4.5-14X 50mm Matte Boone & Crockett SF $779
4.5-14X 50mm Matte Varmint Hunter SF $779
4.5-14X 50mm Matte Illum Fine Duplex SF.....$879
4.5-14X 50mm Matte Illum German #4 SF.....$879
6.5-20X 40mm Gloss Fine Duplex SF $679
6.5-20X 40mm Matte Fine Duplex SF $679
6.5-20X 40mm Matte Varmint Hunter SF $759
6.5-20X 40mm Silver Fine Duplex SF $679
6.5-20X 50mm Matte Fine Duplex Tgt SF $799
6.5-20X 50mm Matte Target Dot Tgt SF.....$849
6.5-20X 50mm Matte Varmint Hunter Tgt SF $879
6.5-20X 50mm Silver Fine Duplex Tgt SF $799
8.5-25X 50mm Matte Fine Duplex Tgt SF $899
8.5-25X 50mm Matte Target Dot Tgt SF.....$949
8.5-25X 50mm Matte Varmint Hunter Tgt SF $979

Mark IV Long Range Tactical

M1 3.5-10X 40mm Matte Duplex.....$874
M1 3.5-10X 40mm Matte Mil-Dot.....$999
M3 3.5-10X 40mm Matte Duplex.....$959
M3 3.5-10X 40mm Matte Mil-Dot.....$1079
M1 4.5-14X 50mm Matte Duplex.....$974
M1 4.5-14X 50mm Matte Mil-Dot.....$1099
M1 6.5-20X 50mm Matte Mil-Dot.....$1149
M1 8.5-25X 50mm Matte Mil-Dot.....$1199

Illuminated Mark IV

M1 4.5-14X 50mm Matte LR/T TMR $1279
M1 4.5-14X 50mm Matte LR/T Mil-Dot.....$1279
M1 6.5-20X 50mm Matte LR/T Mil-Dot.....$1329
M1 6.5-20X 50mm Matte LR/T TMR $1329
M1 8.5-25X 50mm Matte LR/T Mil-Dot.....$1379
M1 8.5-25X 50mm Matte LR/T TMR $1379

LCS Competition Scope (30mm Tube)

35X 45mm Matte FCH or 1/8 Dot SF $999
40X 45mm Matte FCH or 1/8 Dot SF $999
45X 45mm Matte FCH or 1/8 Dot SF $999

We also offer a complete selection and the largest inventory of **Leica, Swarovski, Trijicon, Aimpoint, Schmidt & Bender, Sightron, Minox, Pentax, Kowa, Steiner, ATN (night vision) & More**

Tech. Support: 925.945.7962
Fax: 925.945.8103

Hours: Monday-Friday 7AM - 6:00PM PDT
Saturday - 8AM - 2:30PM PDT

Orders: 800.641.4470

Visit our website for a complete listing of products & prices!!

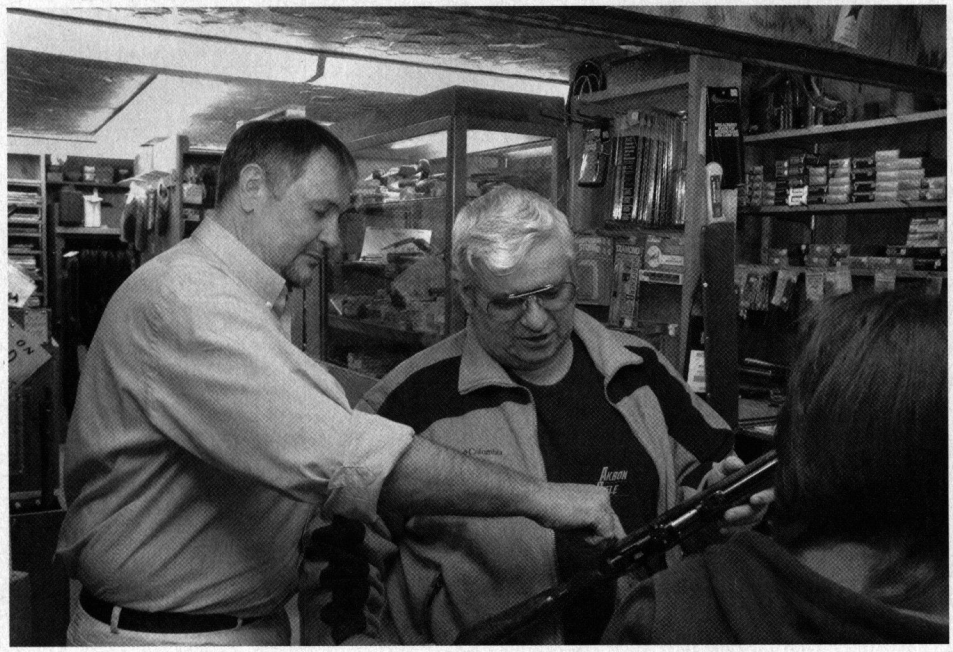
WWW.BEARBASIN.COM

Your Satisfaction Guaranteed!! Items May Be Returned Within 15 Days If In Their Original Condition And Unmounted. All Returns Less Freight And Handling And MUST Have A Return Authorization Number.
Prices Subject To Change Without Notice! ALL MAJOR CREDIT CARDS ACCEPTED . . WE WILL MEET OR BEAT ANY ADVERTISED PRICE; IN STOCK FACTORY AUTHORIZED DEALERS

Good News for Cooper Owners

BY ROLAND PAOLUCCI

Long time owners of Cooper rifles can remember when it was possible to buy a Jewell trigger for their rifle(s). Unfortunately, Jewell triggers for Coopers have not been available for over ten years, and when one appears for sale, upwards of $400 is the going price. First, let me state that there is nothing wrong with Cooper triggers. They come from the factory tuned and set at a crisp 2 to 2½ pounds, with no take-up or creep. A good trigger mechanic (your local qualified riflesmith) can set them down to somewhere near a pound, if required. For most of us, these options can completely satisfy our needs. However, competitive benchrest shooters, both centerfire and rimfire, prefer a trigger set in the 2 ounce range.



Dan Cooper (on the left) points out a feature on one of his rifles to an interested customer. Cooper made an appearance at Dick's Gun Room in Cuyahoga Falls, Ohio during a "Cooper Day" in March. Some forty Cooper rifles were on display and Dan was on hand to answer questions and take special orders. Certain model Cooper rifles can be purchased with a number of upgrades, including engraving, case coloring, inleted swivels, Neidner and skeleton butt plates, and wood upgrades.

Enter benchrest shooter Tom Rosenberger. Tom owns a Cooper TRP-3 and finds it to be his most accurate .22 rimfire. However, he has been unsuccessful in finding a Jewell trigger – most owners won't even consider parting with theirs – I know I won't!

Tom decided to do something about it. He fired off letters to a half a dozen trigger makers, asking if they would be interested in making a competition trigger for his Cooper. Their names are not important – just let me say that you would probably recognize all of them. All but one responded that there was not a large enough market to support the R & D costs. Tom did get a favorable response from Dean Van Marel, owner of JARD Triggers, a **PS** advertiser. His company produces complete triggers as well as trigger part replacement upgrades for many rifles. A partial list of rifles for

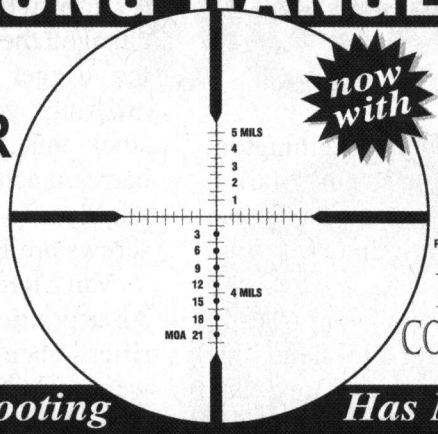
Continued on page 34

ATTENTION LONG RANGE SHOOTERS

LEUPOLD®
SCHMIDT⊙BENDER

Long Range Shooting has never been easier. Our unique reticle design provides the shooter with 30 precise aiming points based in "Minutes of Angle". We eliminate the need to dial for virtually all calibers up to 800 yards.

Call for FREE DVD and Ballistic Profile.



now with ART Advanced Reticle™ TECHNOLOGY by Darrell Holland
PATENT PENDING

NO OTHER SCOPE-RETICLE COMBINATION CAN COMPARE!

Precise Long Range Shooting Has Never Been Easier!

NEW PRODUCTS
From Holland's Shooters Supply

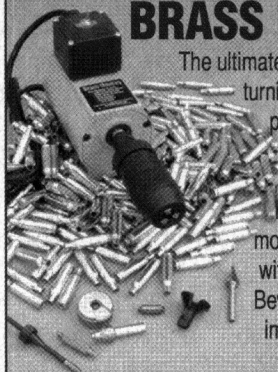
ONLY $28.00

ONLY $25.00

SOLID CARBIDE

Our primer pocket uniformer (both large and small) and case mouth chamfer tool are the best money can buy. The 14° angle provides better seating for flat base and boattail bullets. Large ergonomic handles make these tools a pleasure to use. Lifetime Warranty*

BRASS MONKEY



The ultimate industrial grade turning center for match prepping cartridge cases. 1/2" precision keyless chuck and heavy duty gear drive motor. Comes complete with all accessories. Beware of cheap imitations!

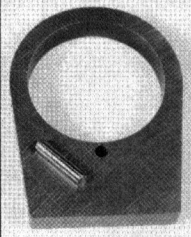
PS SUBSCRIBERS CALL FOR SPECIAL PRICING

Witches Brew
Copper & Carbon Solvent

ONLY $8.00 $15.00(8oz)

Stroke for stroke nothing cleans stubborn copper and carbon like the Brew! 10 to 15 strokes is usually all it takes. Contains no ammonia. 8 oz and 2 oz sizes available.

Call for Dealer Pricing and FREE Sample!!!



Remington 700 Competition Recoil Lug

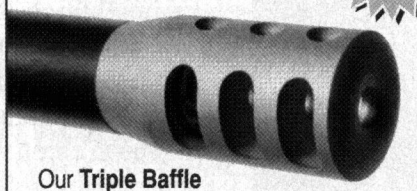
A full .250 thick, double disc ground for flatness and uniformity. Available in 17-4 s/s, and chrome-moly steel. Can be pinned for switch barrel applications.

Used by more gunsmiths than all other lugs combined.

ONLY $30.00

QUICK DISCHARGE™ MUZZLE BRAKES

ONLY $200 INSTALLED



Our **Triple Baffle** design gives fantastic recoil reduction and muzzle rise elimination. Gunsmiths call for Special Pricing and Discounted Sample.

AMBIDEXTRIOUS THUMBHOLE STOCK
FOR REMINGTON 700's.

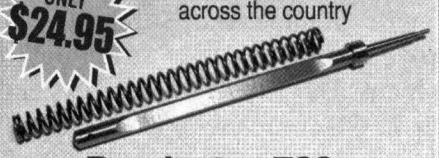
Simply the finest most comfortable thumbhole stock you have ever shot! Available in short/long action, ADL BDL configuration. Molded gel-coat or carbon fiber. CNC Machined for a perfect fit.

NEW

IN STOCK FOR IMMEDIATE DELIVERY!

ONLY $24.95

Used by top gunsmiths across the country



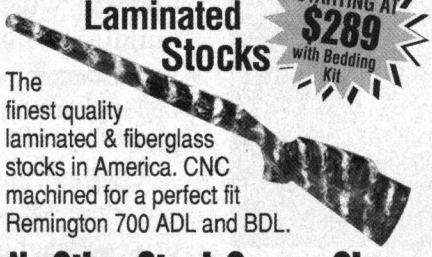
Remington 700
Speed Lock Firing Pin & Spring

Improves lock time, stops primer flow and cratering
Available for long and short action guns.

A Must for Your Remington 700

Fiberglass and Laminated Stocks

STARTING AT $289 with Bedding Kit



The finest quality laminated & fiberglass stocks in America. CNC machined for a perfect fit Remington 700 ADL and BDL.

No Other Stock Comes Close
Our Stocks Are Better by Design

TURNING NECKS?
We've got the Micrometer for You!

17 CALIBER - 50BMG

$75.00 Micrometer

$25.00 Fully Adjustable Micrometer Stand

HOLLAND'S SHOOTERS SUPPLY P.O. Box 69 · Powers, OR 97466
Check out our website at: **www.hollandguns.com**

541 439-5155
or FAX 541 439-2105

VISA MasterCard

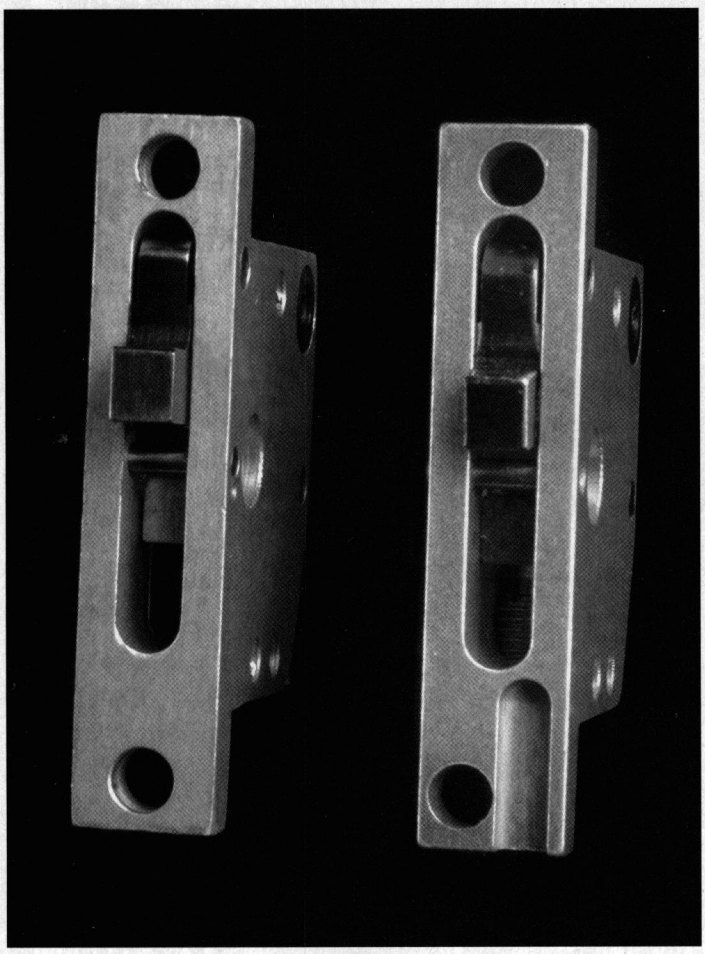
Good News For Cooper Owners

Continued from page 32

which he has engineered triggers includes Remington, AR-15 and AR-10, Sako, Winchester, Ruger, Marlin, Weatherby, Mauser, and Browning. A complete list can be seen on his website, which will be found at the end of this article.

After a phone discussion with Van Marel, Rosenberger felt encouraged and agreed to "lend" his rifle to Dean. Several months passed and one day *Brown* delivered his rifle with a prototype 2-ounce JARD trigger installed. Tom was very pleased with it and has subsequently used it successfully in several matches. He loves the trigger.

I have had the opportunity to evaluate Dean's triggers on two of my Coopers, a Model 38, and a Model 21. They incorporate the original factory safety and compare very favorably to my Jewells. I have also used one of his Remington match triggers. I found it to be a first-class design.



This picture of two original Cooper triggers clearly shows the difference in the old versus the newer model. The older model with offset screw holes is on the right, and the newer in-line trigger is on the left.

A word of caution. A few years back, Cooper Arms changed the position of the forward screw that mounts the trigger to the bottom of their action. Before ordering, you should remove your action from its stock and take a look at the trigger. Viewing the barreled action from the bottom, you should be able to readily see if the front and back trigger mounting screws are in line, or offset. (See photo)

Van Marel is a self-taught tinkerer (his own words). As a prairie dog shooter, he hunted with bolt-action rifles. Then, just before the Clinton assault rifle ban went into effect, Dean decided that it might be a good idea to get an AR-15 while he could. He was dismayed by the trigger so he bought an aftermarket one. Still not fully satisfied, he decided that he could build a better mousetrap, and proceeded to do so. So began JARD Triggers. (By the way, I asked the origin of the JARD name. Simply, it is the initials of his daughter **J**ena, wife **A**my, son **R**yan, and his, **D**ean.) One by one Van Marel began designing and making triggers for other rifles. In addition to triggers, Dean has also designed and is manufacturing a semi-auto 50 BMG. Dean informs me that he is currently working on a 3-lug bolt-action centerfire repeater that should be available soon.

A complete catalog of JARD products can be seen at: www.jardinc.com.

While we are on the subject of Cooper rifles, Dan Cooper, owner and driving force at Cooper Arms, is in the process of opening a new production facility in Canton, Ohio. Cooper produces semi-custom highly-accurate hunting and target rifles. This operation will be in addition to their current facility in Stevensville, Montana. Eventually 40-45 employees will be hired and trained. Some employees will be sent to the home plant in Montana for advanced training.

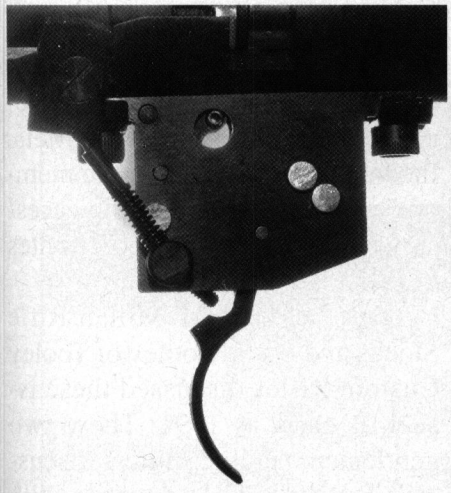
The Canton Community Improvement Corporation approved a deferred economic development package, providing funds for renovations to an existing 40,000 square foot building. The agreement is the result of talks with city government that began a year ago. The project is expected to cost in the area of 1.5 million dollars, which will include the purchase of the building, improvements to the structure, and machinery/equipment. The city of Canton was chosen because a partner in the company is from the Canton area.

Cooper envisions the project as a three-phase program. Phase One includes the installation of CNC driven machinery with programming, after which production will commence. This is expected to ease some of the pressure on the Montana facility and also allow for the introduction of new products. Phase 2 will expand parts production, some of which is

currently being subcontracted out of house. Phase 3 will be the production of complete rifles. Dan is concerned about the humidity here in Ohio and how to deal with it, at least as it relates to stocks for his rifles. Cooper rifles have always been known to have attractive Claro walnut stocks. The facility will have provision for separate 50 and 100-yard indoor testing ranges.

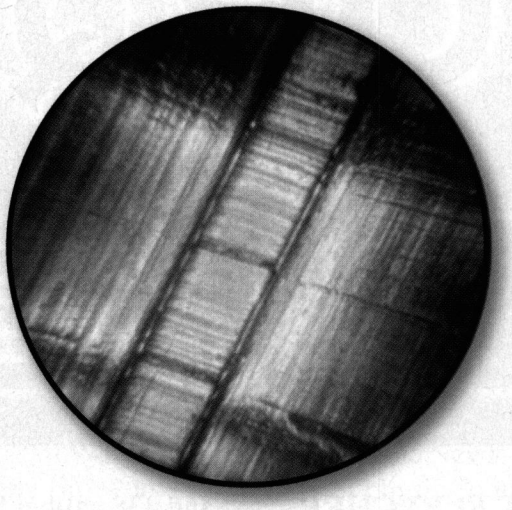
JARD, Inc
2737 Nettle Ave.
Sheldon, IA 51201
712-324-7409
Email: jardinc@excite.com
www.jardinc.com

Cooper Firearms of Montana, Inc.
P.O. Box 114
Stevensville, MT 59870
406-777-0373
Email: info@CooperFirearms.com
www.CooperFirearms.com



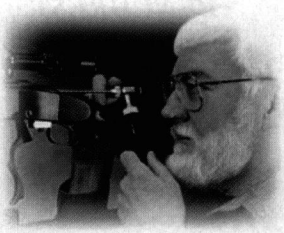
The new Jard trigger for Cooper rifles can be set as low as 2 ounces and is perfect for competitive shooting. The factory Cooper safety is functional. Instructions for setting weight and sear contact are included. It is recommended that these adjustments be done by a qualified riflesmith.

Defects.



Defects happen.
What's in the chamber, leade, and bore of your newest firearm?
The Hawkeye knows!

Hawkeye® Borescopes inspect firearms for defects that affect accuracy. Image rotation allows 360° examination of lands and grooves with the clarity of a medical endoscope. Adjustable focus $845, Limited Edition $645.
Now avaliable in 22" length, also in a .17 caliber model.



EYE® PRECISION BORESCOPES
Designed, made and sold by precision shooters!
Gradient Lens Corporation 800 536 0790 www.hawkeyeshooting.com

NEAL JOHNSON'S
GUNSMITHING, INC.
30 West Buchanan Street, Colorado Springs, CO 80907

Dewey
Cleaning Equipment

Anschütz & Gehmann
Accessories

neal@nealjguns.com
www.nealjguns.com

We carry -
Grünig & Elmiger
Bleiker
Olympic Arms
Sales & Service

TSI 301
Synthetic
Lubricant
Solvent

VISA MasterCard DISCOVER Diners Club International

Customer Service: (719) 632-3795 • **To Order: (800) 284-8671** • Fax Line: (719) 632-3493

TORQUE TAMER

BY SCOTT FLETCHER

AN OFF-SET RIFLE STOCK FOR LONG RANGE, "3" CALIBER, LIGHT GUN BENCHREST

BACKGROUND

Extreme Violence: These words accurately describe the recoil and tracking issues associated with 30 and 338 caliber bullets being fired from any IBS/NBRSA/PA 1000 yard benchrest light gun weighing from 16½ to 17 pounds. Even with the ubiquitous muzzle brake, the recoil from the "3" calibers becomes significant to unpleasant. Free recoil shooting techniques give way to wrestling with a stock embedded firmly in the shoulder. If recoil was the only issue, a significant number of long-range benchrest shooters would undoubtedly opt for shooting the high B.C. "3" calibers. However, the rolling or twisting (torque) of the rifle on the bags becomes so noticeable to the point where the non-trigger hand is typically used to apply a counter-twist force, most often with an under hand grip that also applies downward force on the stock fore-end just behind the front rest. The twisting of the stock combined with the significant recoil results in an inconsistent return to battery, particularly when shooting 338 bullets. Inconsistency in the "muscle memory" associated with the grip necessary to control the rifle contributes to fliers.

Figure 1.

Dick Davis of McMillan Rifle Stocks and David Tooley of Tooley Custom Rifles discussed these issues as early as 1991. These two gentlemen had intermittent discussions about reducing torque with an off-set stock. At the 2004 SHOT Show, Dick and Dave discussed a conceptual off-set stock design where the weight of the barrel, action, and scope was off-set to the right of the rifle's center line. They theorized that this weight, operating on a longer lever arm made possible by the off-set stock, could

possibly neutralize the counter-clockwise torque generated by clockwise (right twist) rifled barrels. Existing light gun front rests built for 3 inch fore ends could be used for a wider 4 inch fore end if a new front bag was fabricated that had the minimum of 1/2 inch of sand at the ears. They had noted that both the IBS and NBRSA 1000 yard benchrest rules imposed no restrictions concerning fore end width. However, neither of these two gentlemen had time to tinker with an actual prototype.

I had intermittently shot 250 grain, 338 bullets in 1000 yard bench rest light gun since 2003, using the iconic Tooley MBR. I had come to know tracking and torque issues "up close and personal." My success shooting this caliber and bullet was anything but consistent. I had been initially teased by setting an NBRSA 1000 yard bench rest six target light gun score record in 2003, but lack of practice/infrequent shooting of this beast did not produce the long- term, consistent results that I was after. To add insult to injury, I noticed that the left ear of my old rear bag was permanently canted to the left because of the torque-imposed rotation of the stock caused by a 250 grain 338 bullet hot footing it down range at 3180 fps. The bag is shown in Figure 1.

David Tooley is my gunsmith, and he would occasionally point out the insanity of my light gun "exploits," typically in words of one syllable. In the fall of 2006, with the image of my old rear bag in clear mental view, I asked Dave if he would allow me to develop a prototype off-set stock based on the MBR. It was to be a collaborative effort, as his gunsmith expertise/practical experience would be very necessary to balance any esoteric "pure engineering" approach that I might conjure up. He agreed, but the look in his eyes could be roughly translated into "Lordy, what I am getting myself into?"

THEORETICAL CONSIDERATIONS

I had to first reflect on the forces involved and their magnitude in order to assess if a four-inch wide off-set stock could satisfactorily resist torque from "3" caliber rifles. One of Isaac Newton's fundamental laws of physics states that for every action, there is an equal and opposite reaction. Thus, right hand or clockwise twist barrels impose a

Continued on next page

Torque Tamer

Continued

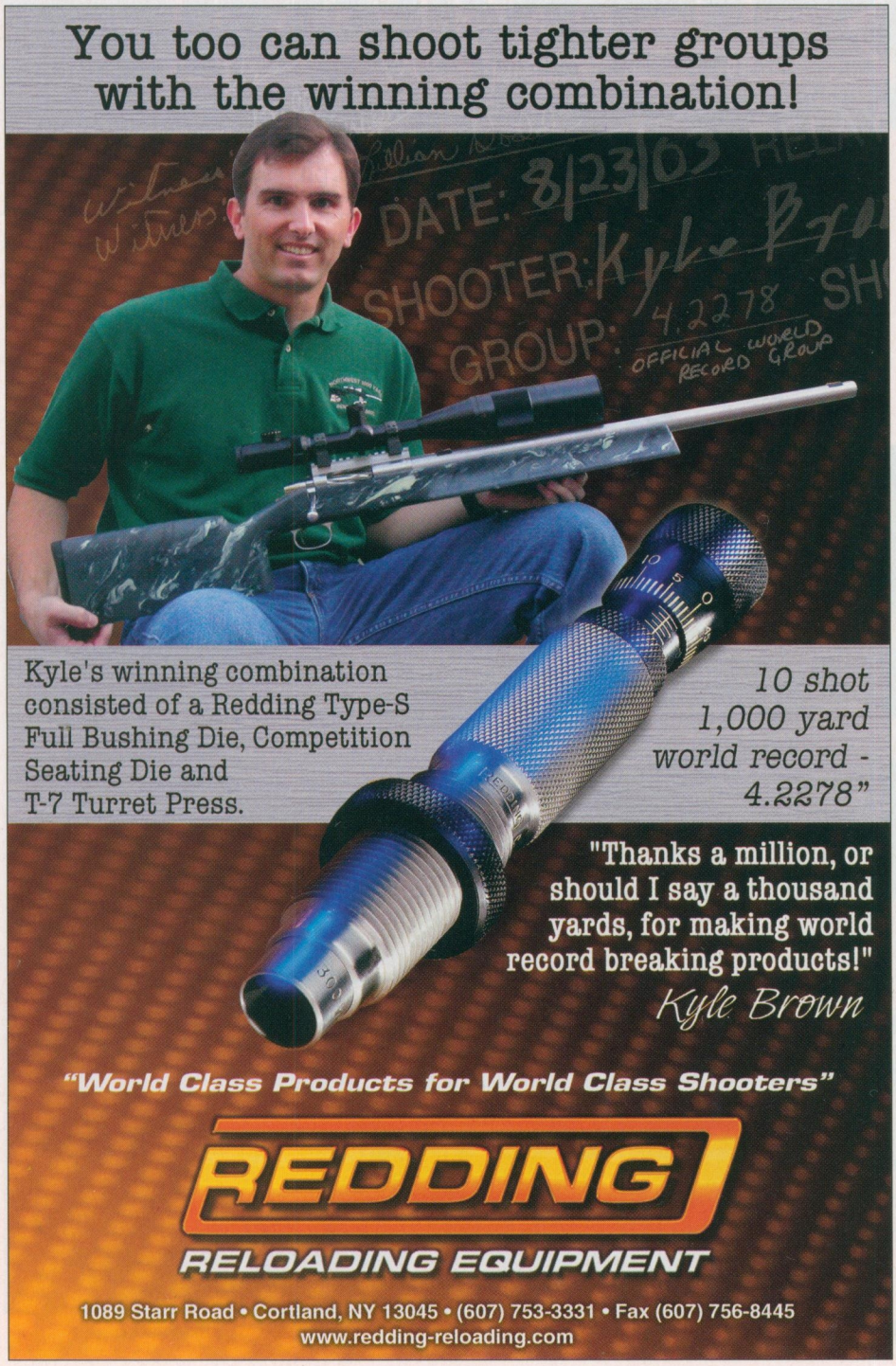
left hand or counter clockwise twist (torque) in response to a bullet accelerating through them. To some, this thinking may sound incorrect. A simple test can be performed with a portable drill to verify this assertion. Pick up the drill and hold it lightly in one hand. Select the speed with the highest rpm. Repeatedly squeeze the trigger and note which direction the drill body wants to rotate in your hand. You should be able to sense a counter clockwise rotation of the drill body as the drill spindle rotates clockwise. When the drill spindle suddenly stops, it rotates clock-wise to its equilibrium position.

The units associated with torque are distance times force, or foot-pounds in English units. If a 1 foot long pipe wrench is used to tighten a plumbing fixture, and a 10 pound force is applied to the end of the wrench, the resulting torque is 10 foot-pounds. The pipe wrench acts as a 1 foot lever arm. If the pipe wrench was 2 feet long, the resulting torque with 10 pounds of force applied at the end of the handle would be 20 foot-pounds because the wrench is twice as long as the 1 foot wrench. This "lever arm" concept is important in understanding why an off-set stock works.

The velocity of the bullet, the diameter of the bullet, the weight of the bullet, and the twist of the barrel all affect the resultant magnitude of the torque. The higher the bullet velocity, the larger its diameter and weight, and a faster barrel twist all result in a greater torque. Assuming all of the following bullets are being driven at pressure (velocities) at or near maximum, Table 1 summarizes the approximate torque generated.

What forces are available to resist the torque imposed by bullets accelerating out of our barrels? The rigorous physics/mechanics answer is the moment of inertia of the rifle. The moment of inertia of any object is the effect of the object's mass acting around its center of rotation. If we use a bicycle wheel/tire as an example, it takes more force to initially spin a 3 foot diameter wheel than it does a 1 foot diameter wheel.

How does this translate into resisting forces available from our rifles? More weight, concentrated farther from the center of rotation, is the key. A heavy scope mounted on very high (elevated) rings provides more moment of inertia as does a tall buttstock that extends well below the action into which



lead can be embedded at the buttstock's base. From a practical and operational perspective, these approaches have limited application, primarily because of the overall weight limit of long range light guns. A "Z" –shaped stock of very light space-age composite materials with a lead weight at the buttstock's base is technically feasible, but I doubt that many of us could afford to purchase one.

The imperfect mechanical solution is to use the previously described lever arm approach. The weight (mass) of the rifle, multiplied by a lever arm, can be used to approximate the torque resistance of our system. To be mechanically correct, such an approach assumes that the center of mass of the rifle is in the same plane as the lever arm provided by an off-set stock.

Based on the weight distribution of most 17 pound light guns, the center of mass (balance point) is about 10 to 11 inches forward of the trigger guard, or 8 to 9 inches behind the stock fore end. In order to get the full lever arm effect, the rifle's center of mass should be directly over the front rest. Otherwise, there will be some component of "orbit/twist" in the

Continued on next page

Table 1

Estimates of Torque from Typical Bench Rest Bullets and Barrel Twists

BULLET DIAMETER (inches)	BULLET WEIGHT (grains)	BARREL TWIST (inches/rev.)	TORQUE[1] (inch-pounds)
.224	80	8	11.1
.243	65	14	8.7
.243	107	8	15.4
.264 (6.5mm)	142	8 1/2	19.9
.284 (7mm)	180	9	25.5
.308	210	11	28.6
.308	240	10	31.5
.338	250	12	38.2
.338	300	11	41.6
.338	300	10	45.8

[1] Values calculated from equations furnished by Henry Childs.

Torque Tamer

Continued

system. Supporting light guns on front rests at the center of mass would result in about a 7 inch stock overhang beyond the front bag. As all of us know, such stock placement results in poor tracking and "frequent fliers," airline passengers not withstanding.

Let's apply some numbers to this discussion to see what torque resistance is available from both a conventional, symmetric, 3 inch wide fore end stock and a 4 inch off-set stock. The lever arm for a 3 inch fore end symmetrical stock is 1.5 inches. The lever arm for the subsequently discussed Torque Tamer off-set stock is 3 inches. If we multiply our lever arms by 17 pounds, our maximum theoretical torque resistance for a conventional 3 inch fore end stock is (1.5) (17) = 25.5 inch-pounds, and our maximum theoretical torque resistance for the 4 inch off-set stock is (3) (17) = 51 inch-pounds.

Let's take a look at Table 1 and perform a "reality check" of the torque induced by our bench rest bullets and barrels compared to the torque resistance of a conventional 3 inch wide fore end symmetrical stock. We can see that shooting a 142 grain, .264 diameter bullet only induces about 20 inch pounds of torque, well below our maximum theoretical torque resistance of 25.5 inch-pounds provided by our 3 inch fore end stock. Having personally shot 4 seasons with a light 1000 yard gun chambered in 6.5-284. I can attest that there were no torque/return-to-battery issues associated with the Tooley MBR that was used. Furthermore, even the very lightest short range bench rest rifle (10½ pounds) offers (1.5) (10.5) = 15.75 inch-pounds of theoretically available torque resistance. This torque resistance is significantly higher than the 9 inch pounds of torque induced by a 65 grain, .243 inch bullet in a 14 twist barrel.

Review of the table indicates that for bullets typically used for long range bench rest, the .284 inch diameter produces a torque equal to our maximum theoretical torque resistance of a symmetrical, 3 inch wide fore end stock. Bullets of the "3" calibers produce torque that increases with bullet weight and faster barrel twists, and all torques are in excess of our maximum theoretical resistance of 25.5 inch-pounds available from a 3 inch wide, symmetrical fore end stock. My 250 grain 338 diameter bullet theoretically produced about 1½ times more torque than the system could resist. My "bent" left ear on my old rear bag is consis-

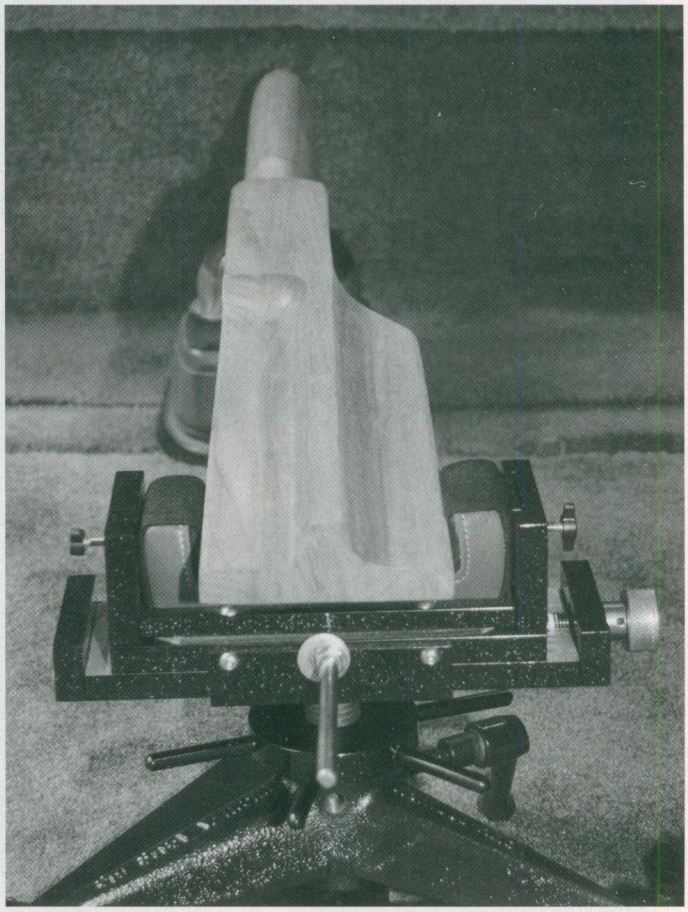


Figure 2.

tent with the numbers presented.

Up to this point, no mention has been made of the rear bag and any contribution it may make in resisting torque. Common sense tells us that if the bag's ears were rigidly attached to the bag and there was a perfect, slip-fit frictionless connection between the ears and the stock, there would be tremendous resistance to torque because of the significant moment of inertia offered by the coupled bag/stock system. Observation of my old rear bag's left ear indicated that ear stiffness initially contributed somewhat to torque resistance, even though the rifle stock was sliding as it was twisting on the bag. However, quantification of this torque resistance is difficult, as the bag's ears are "flexible" compared to an idealized fixed channel in which the stock must slide in order to accurately quantify torque resistance from the bag.

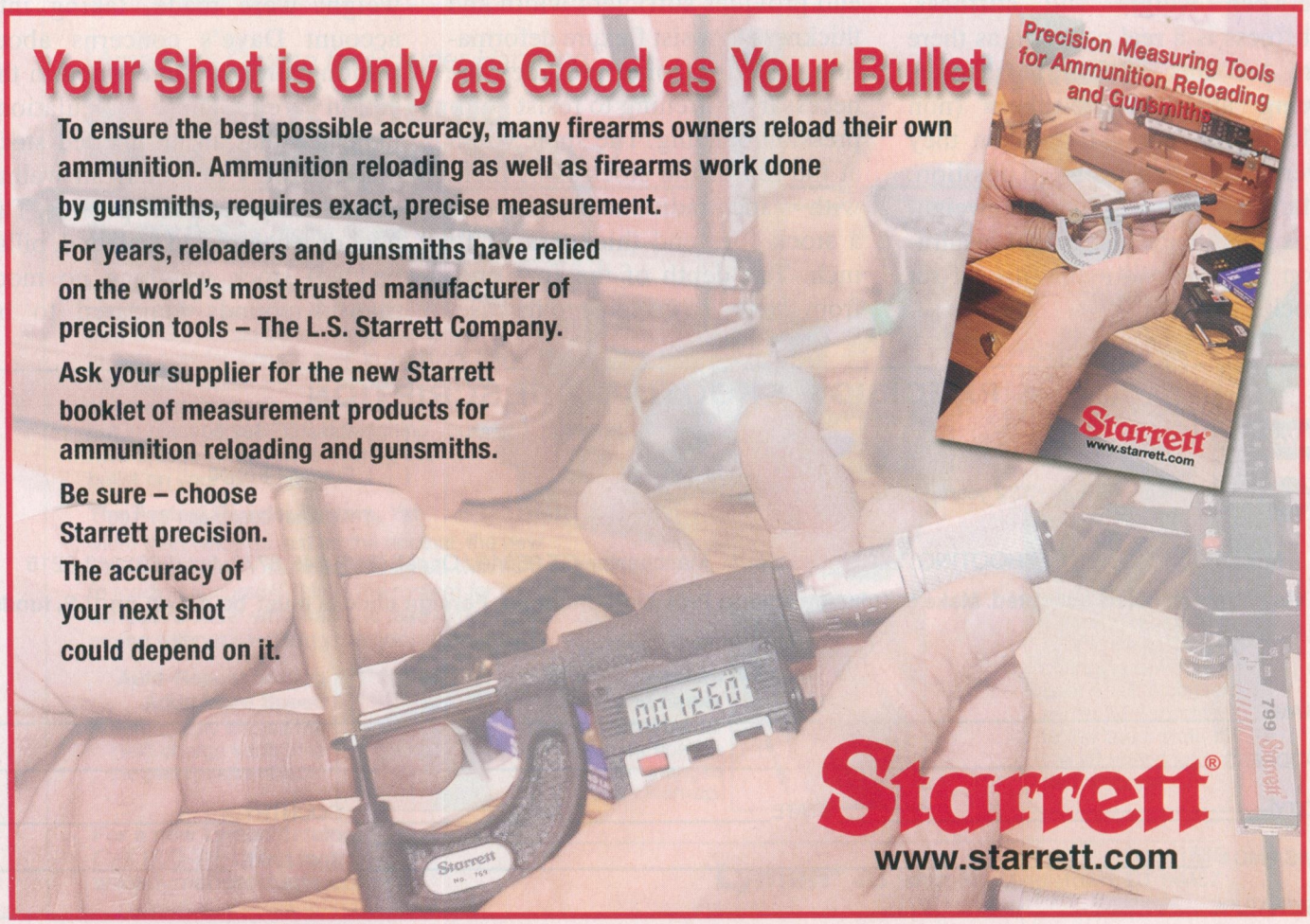
To make a long story short, calculating torque resistance from an uncentered mass as well as from a flexible, "dynamic couple" at the rear bag is well beyond my meager physics/dynamics education. Based on the calculations presented, I decided that I would use a 3 inch lever arm with a 4 inch fore end in designing the stock, hoping that the inferred modest torque resistance of the rear bag's ears would tend to compensate for a system whose center of mass was not in the same plane as the lever.

THE DESIGN

The previous calculations provided the basis for the primary component of the design: the lever arm. Other important stock design considerations were: 1) the ability to "hang on" to the rifle if need be, 2) a hefty buttstock and pad to absorb/control recoil of calibers in the "3"s, and 3) the ability to accommodate action diameters of 1.55 inches with lengths up to 8½ inches, such as a BAT. The original Tooley MBR design accommodates these operational issues quite well, and the subsequently discussed Torque Tamer stock is essentially an MBR from the action bedding area rearward to the buttstock.

Measurements of the MBR in the action bedding area indicated that the maximum lever arm that could be used was 3 inches. Any lever arm greater than 3 inches would begin to encroach on the width of material in which the action could be bedded, an MBR modification that I knew would not be well received by my colleague Mr. Tooley. As previously calculated,

Continued on next page



Torque Tamer

Continued

the 3 inch lever arm appeared to provide sufficient resistance to the torque induced by a 300 grain bullet in a 10 twist barrel.

The prototype was constructed of wood, as investing in molds to "tinker" in fiberglass was out of the question. The goal for the prototype stock weight was 4 pounds, as my existing MBR used to shoot 338 bullets weighed slightly less than 4 pounds.

Stock stiffness is a concept that everyone talks about, but seldom quantifies. McMillan subjects their fiberglass stocks to destructive testing (they break them) and measures load and deflection during testing. The intent is to have strategically placed fiberglass that provides an optimal trade-off between weight and stiffness. Stiffness is a real concern, as there are accounts of F-class shooters being able to see their (non McMillan) stocks flex when they were in the shooting position. Marrying stiffness to low weight was going to be a stroke of inspiration necessary to make this off-set stock work.

I made a crude and simplifying assumption that for any given cross-section, American walnut would have the same unit weight as fiberglass with its associated foam in-fill. If the wood stock weighed more, there would likely be areas to "whittle," and longitudinal holes could be drilled in the buttstock to "hollow it out" if need be. I calculated the approximate end area of the current MBR fore end, as Dave had already passed judgment that that the section was sufficiently "stiff." I transposed this end area into the fore end section in Figure 2, using the center "spine" as a stiffener. The shape in Figure 2 resembles an up-side-down "T" beam, a structural section that is routinely used in reinforced concrete bridge decking. Wood will fail in flexure (side to side buckling) or compression before it fails in tension. The fore end provides sufficient width and thickness to resist flexure deformation, and the spine provides the necessary stiffening to resist compression/bending. The spine width at the top of the stock is 1/2 inch, with 3/4 inch radii that transition to a stock fore end thickness of 1/2 inch. The depth of the fore end, from the top of its spine to its base, is 1 1/4 inches. The centerline of the action is 1 inch from the "short" side of the stock, leaving about 1/4 inch of material between the periphery of a 1.55 inch BAT action and the outside periphery of the stock at the inlet.

The depth (height) of the Torque Tamer in the inlet area is the same as the depth of a regular MBR. However, there is a 1/2 inch off-set in the fore end beyond where the action is bedded, primarily to reduce weight.

Johnny Byers was retained to make the prototype. He took a wood MBR clone that had "gone astray," and glued an off-set section to the left side of the stock. Bondo was used, it was eight cases of ugly..., but it worked! Weight was about 4 1/2 pounds, and the wood was a combination of maple and walnut.

Further calculations concerning weight were made, taking into account Dave's concerns about wanting slightly more wood in the action area. These calculations indicated that an un-inletted stock made entirely of American walnut should weigh about 4 pounds. The goal of a completed (inletted, pillar bedded) stock weighing no more than 4 pounds appeared to be

PRECISION SHOOTING SUBSCRIPTION

VISA MasterCard

U.S. ( ) 1 year - $37.00

U.S. ( ) 2 years - $70.00

Foreign, 1 year: ( ) Canada - $62.00

( ) Europe - $70.00

( ) All other countries - $75.00

MAIL TO: PRECISION SHOOTING, 222 McKee Street, Manchester, CT 06040 / Or call (860) 645-8776; fax (860) 643-8215

Visa or MasterCard accepted. Make checks payable to Precision Shooting. Foreign checks must be drawn on U.S. funds.

( ) NEW ( ) RENEWAL

NAME _____ PHONE # _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____ COUNTRY _____

VISA/MC # _____ EXP DATE _____

SIGNATURE _____

within reach.

Johnny made another prototype based on "Frankenstein," the name given to the original prototype (as well as my current light gun). After smoothing and minor modifications the resultant finished stock conforms to the shape/configuration depicted in Figures 3, 4, and 5. The weight of the un-inletted American walnut stock was 4 pounds. He was further commissioned to craft an offset stock in English walnut. This un-inletted stock weighed about 3 pounds, and the inletted, pillar bedded completed stock weighs about 2½ pounds with a Pachmayr XLT recoil pad. (Figure 6) This stock weight allows use of an unfluted barrel (1 inch diameter at the muzzle, 30 inches long)

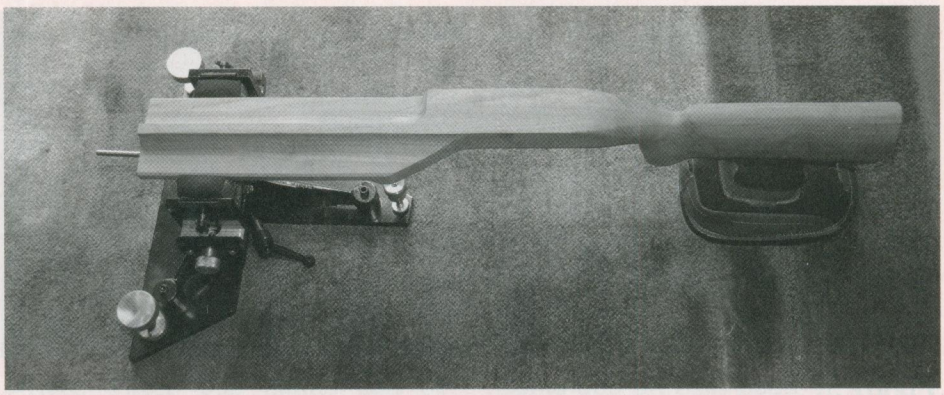


Figure 3.

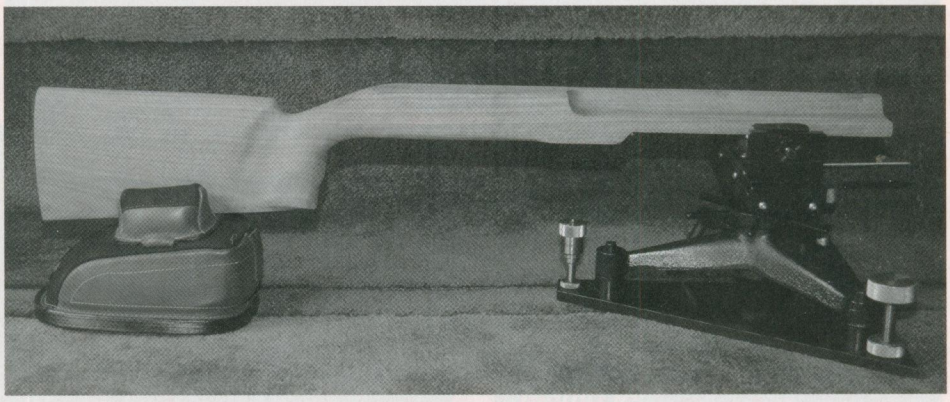


Figure 4.

Continued on next page

"America's Choice for Powder Handling"

So Fast It Should Have a *Racing Stripe!*

Lyman®
Brands That Perform

The 1200 DPS 3's Higher Speed and New Auto-Repeat Setting Let You Weigh Every Charge.

Imagine precisely weighing every charge you load nearly as fast as using a measure. With Lyman's new DPS 3, it can be a reality. This is the fastest powder system ever. In addition, the new Auto-Repeat Setting throws a precise charge automatically each time the pan is put in place. The DPS 3 is weighing your next charge while you're seating the bullet on your last charge.

The Fastest Powder System, Yet

More than twice as fast as the original, the new DPS 3 sets a new standard for speed with no compromise to loading accuracy. This is the system for any accuracy minded reloader who wants to load larger quantities of ammo without sacrificing precision.

Upgrade Any Earlier DPS To Equal the New DPS 3 High Speed Performance.

This inexpensive replacement system installs in seconds and requires no tools. In fact, it's easier than changing powders. Best of all, it converts earlier DPS models to the latest state of the art speed and performance.

Auto-Repeat Setting Adds More Speed

Automatically throws the next charge each time the pan is put in place.

Change Powders Faster and Easier

Quick-Drain Powder Reservoir speeds powder changes and clean-up.

For a new Lyman catalog:
Call 800-22-LYMAN or
www.lymanproducts.com

Lyman® Dept 1635
475 Smith St., Middletown, CT 06457

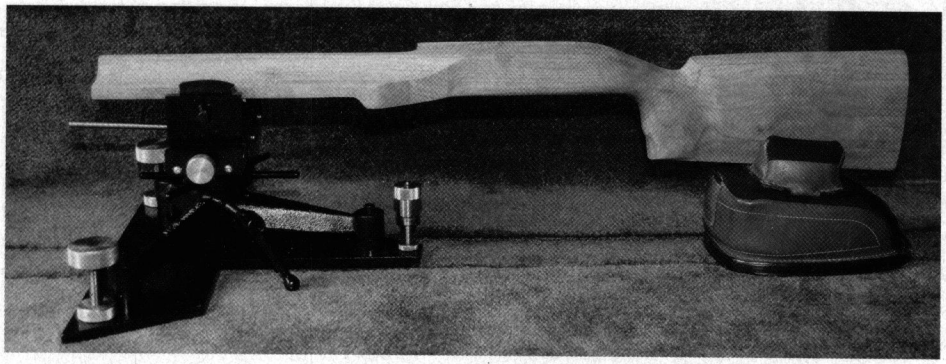


Figure 5.

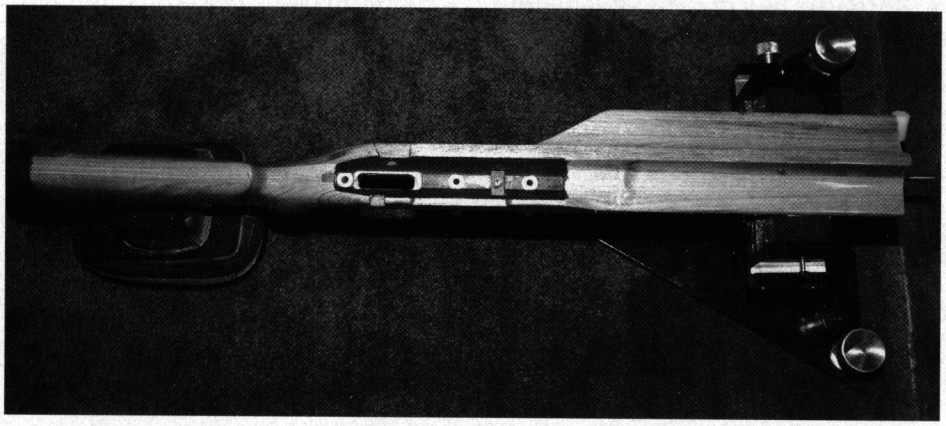
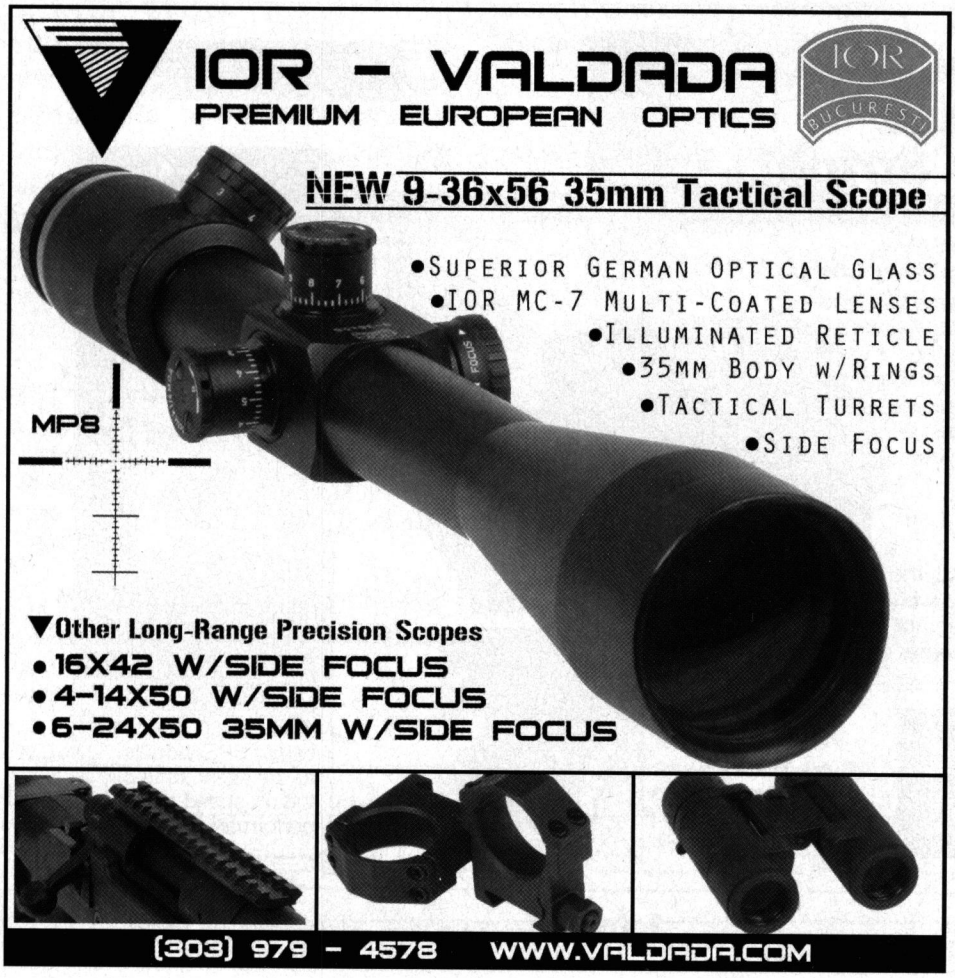


Figure 6.



Torque Tamer

Continued

weighing slightly over 8 pounds, a Night Force scope and an 8½ inch BAT action. (Figures 7, 8, and 9) The total weight of the rifle, as shown, is 16.95 pounds.

No doubt some of you have looked at the figures and have muttered phrases that include the word "flimsy." ("Ugly" is a far different topic. My only response is beauty is in the eye of the beholder.) I know this to be true because my good friend and fellow long range shooter Jim Hardy said so when he first saw pictures of the prototype. My somewhat unscientific and totally qualitative response is that I took my English walnut stock, put it on the floor, and stood on it with one leg. My foot was in the middle of the "T" beam fore end. I could not feel or sense any flexing or bending as I applied my weight. I also jumped up once (not very high) and landed on the stock with one foot. Again, no flex or deformation was sensed (and the Bondo and Gorilla Glue were put back in the cupboard with great pomp and circumstance.)

Dave Tooley inletted the action area, pillar bedded the action, and finished the stock. When I went to pick up the completed rifle, I took a BAT action wrench and a Snap-On 150 inch-pound torque wrench to measure the static torque resistance of the system as it rested on the bags. The action wrench weighs about the same as the bolt. I place the rifle on the bags, with the fore end approximately 3 inches beyond the leading edge of the front bag. This fore end placement was about as far forward as I felt was reasonable. I was trying to accommodate moving the center of mass forward for better torque resistance versus "positive" weight supported by the

rear bag. I turned the torque wrench counter clockwise and read the dial indicator as Dave watched the right side of the stock for "lift-off." I consistently read about 50 inch pounds before the stock lifted its right side off the front bag. It was beginning to look like "Mad Science" might actually work.

We recognized early on that no 4 inch wide front bag with 1/2 inch wide (thick) ears was available that could fit on commonly available front rests. We commissioned Jack Snider of Edgewood Bags to craft bags shown in Figure 10.

SHOOTING CALIBERS IN THE "3'S" WITH TORQUE TAMER

2007 was spent learning to shoot "Mr. Frankenstein." As I subsequently discovered, I had acquired bad habits from shooting 338 caliber bullets with a regular MBR. These bad habits can be summarized as "wrestling" with the rifle. My preferred shooting style resembles basically that of a free-recoil bag squeezer, where the left hand "steers" the muzzle and provides the follow-through. My left hand has never been used to provide additional stability to the rifle as it is fired. Consequently, shooting light gun in 338 had resulted in my right hand imposing a death grip on the pistol grip

Continued on next page

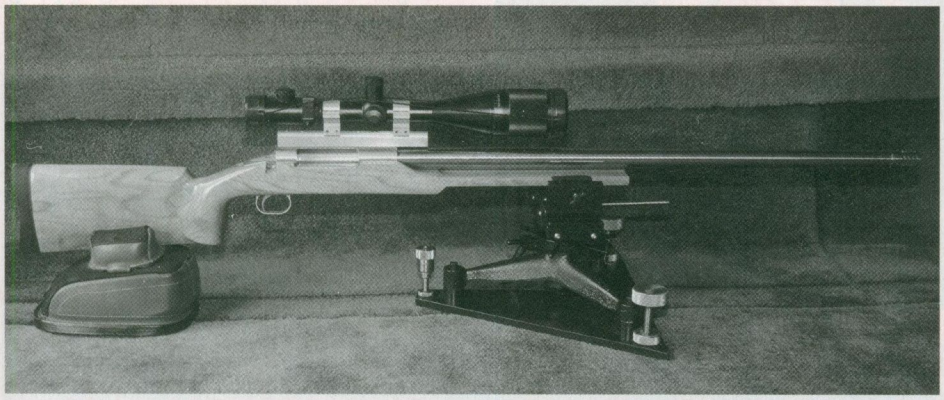


Figure 7.

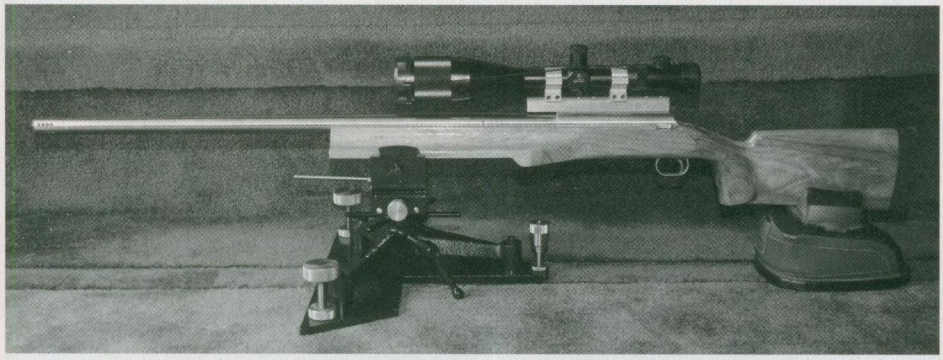


Figure 8.

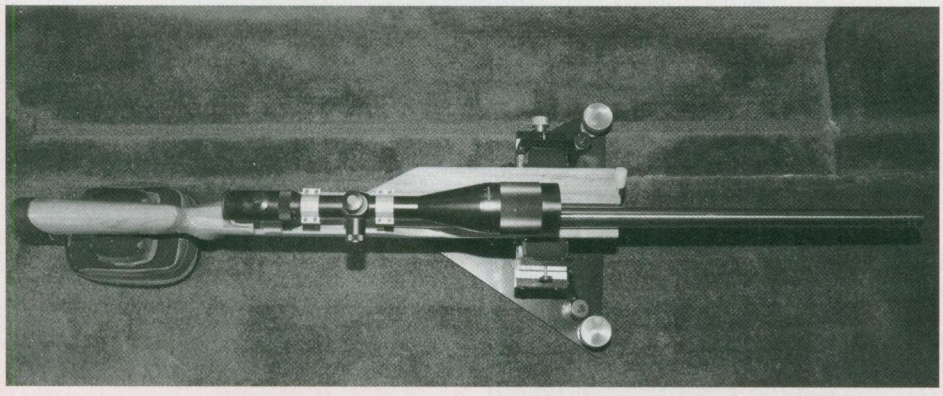


Figure 9.

"Berger Bullets Have an Uncanny Ability To Find the X-Ring!"

...says Jorge Puignau (JP) of Pembroke Pines, FL. "Berger Bullets are very consistent from lot to lot. My x-count has gone up dramatically since I started using Bergers." JP shot a 200-19x at 600 yards in the 2007 Regional at Malabar, with an aggregate of 600-53x.

JP uses a Quadlite action, Krieger barrel, and Davies trigger on a rifle built by Jim Cloward, with moly coated Berger 6mm 105gr. VLD bullets.

Berger offers a full line of match grade rifle bullets for competition, varmint, and game hunting. Ask your dealer if they stock Berger Bullets or visit our website for full details.

I SHOOT BETTER
I SHOOT BERGER

BERGER BULLETS
Made Exclusively With J4 Precision Jackets

4275 N. Palm St. Fullerton, CA 92835 PHONE (714) 447-5456 FAX (714) 447-5478 sales@bergerbullets.com

www.bergerbullets.com

Made in America

Torque Tamer

Continued

portion of the stock. The variables introduced by a "muscled-up" grip and inconsistent placement of the stock in the shoulder undoubtedly contributed to fliers (more on that later) and wildly inconsistent scores and groups. Practice this past winter has convinced me that consistent placement of the stock into the shoulder is necessary to reduce the prospect of fliers.

My preferred shooting style can be described as a modified free-recoil technique. When I was shooting 6.5 caliber, there was "no" grip applied by the right hand other than hand placement on the pistol grip to mobilize and use the trigger finger. The stock just touched the T-shirt rather than my shoulder. The stock then recoiled the 1/4 inch or so into my shoulder so I could stop it and return the rifle quickly to battery. My "natural" position is to have my body parallel rather than perpendicular to the rifle, with the left elbow pointing directly at the target to accommodate gripping the rear bag.

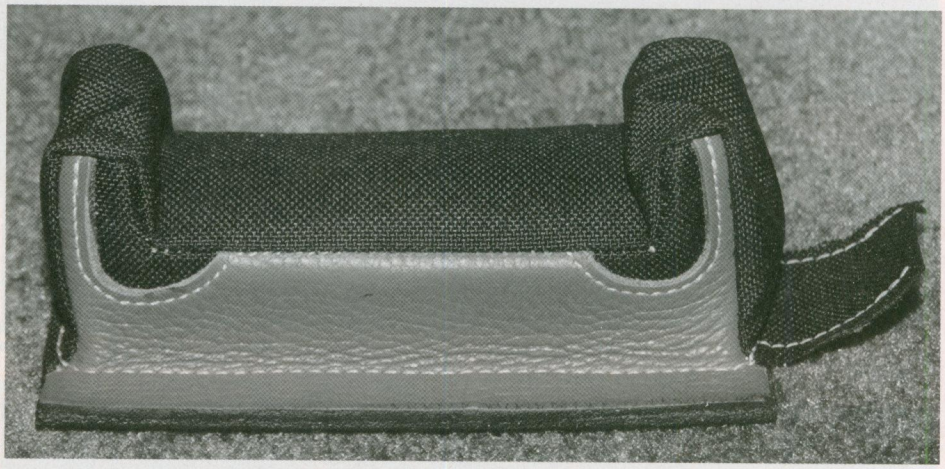


Figure 10.

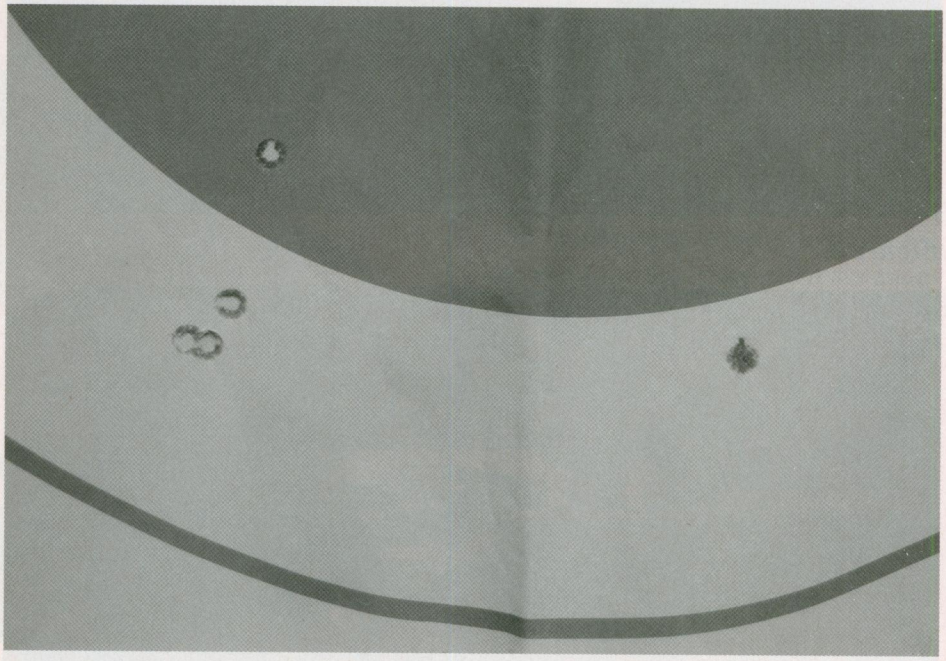


Figure 11.

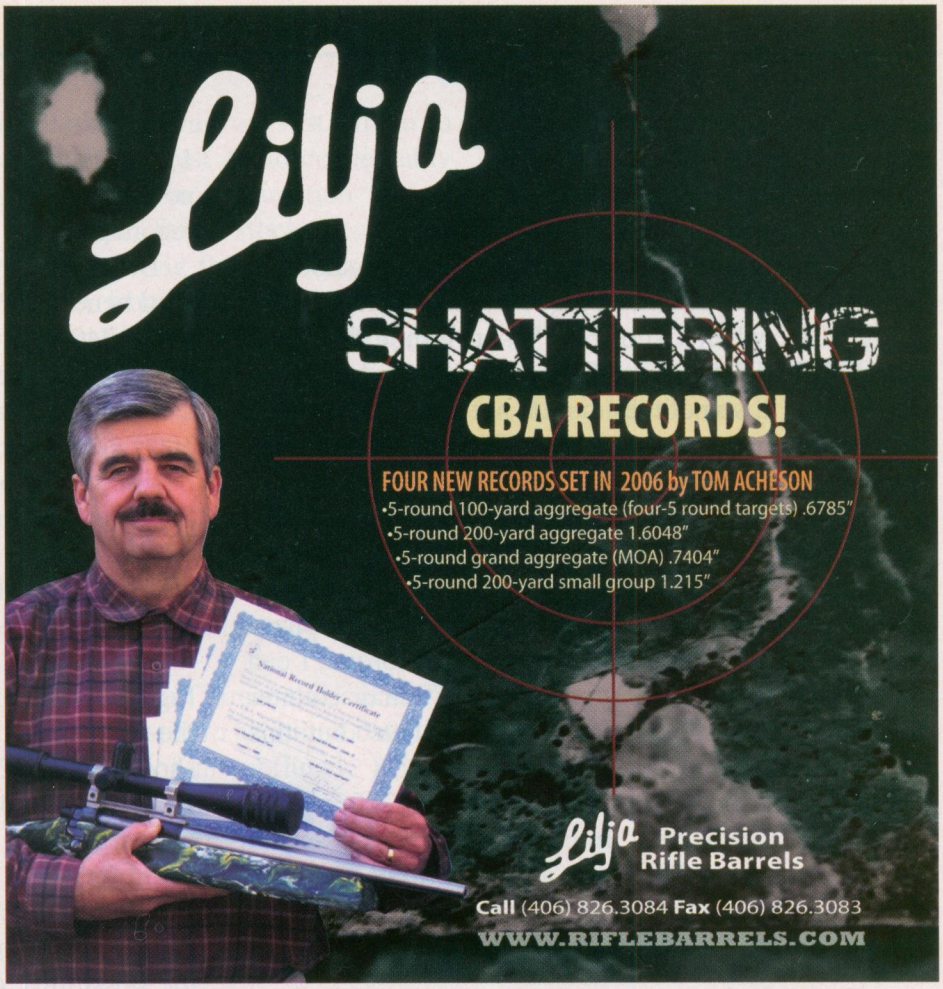
If you look at Figure 8 again, you can see that there has been a significant notch cut out of the base plate of my front rest to allow room for my left elbow placement. This modification occurred in response to ruining a near-record group by flinging one "to the right." (More on this later as well.) The aggressive forward placement of the left elbow has also caused my head to move forward. I soon discovered that the scope needed to be moved forward to accommodate a truly comfortable placement of the left elbow.

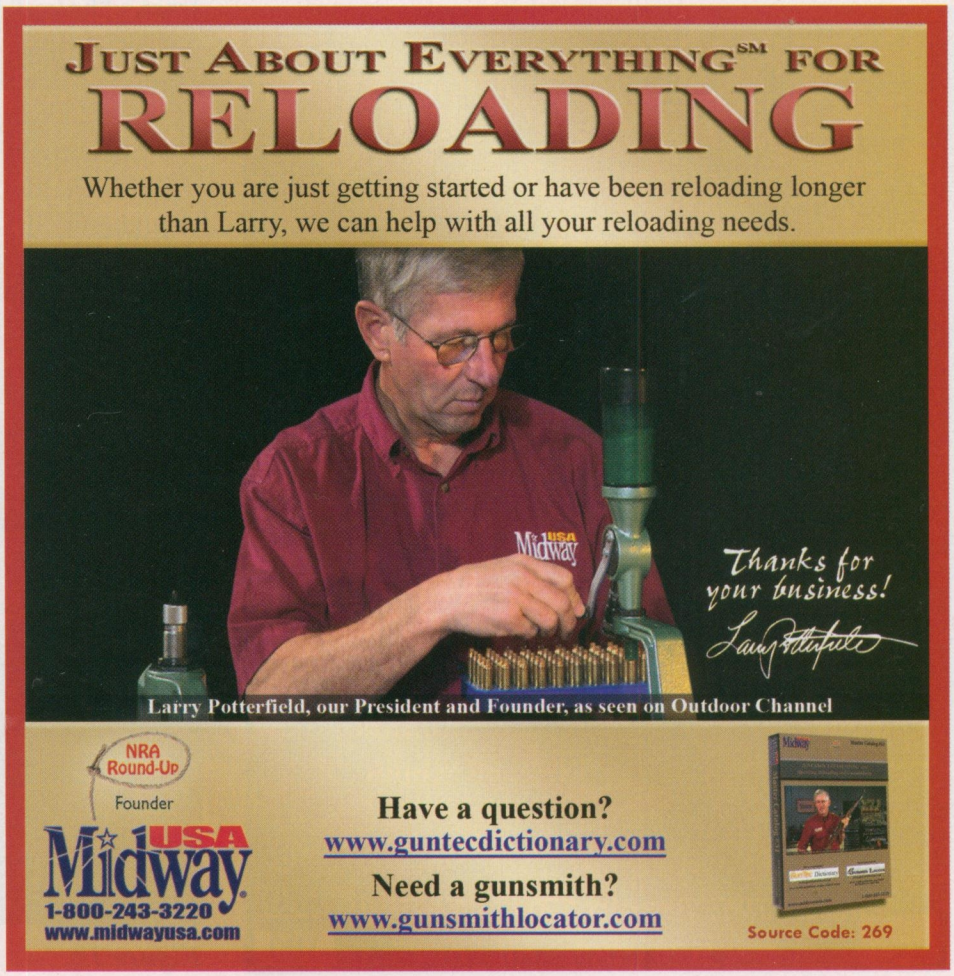
If you look at either Figure 7 or 8, you can see that the scope is positioned forward of the action. This was the final ingredient to feel comfortable on the rifle. The extended scope rail was fabricated by Dave and fitted after the season was finished.

I am essentially back to my modified free recoil position when shooting calibers in the "3's." The only exception is that the right shoulder pocket encompasses the buttstock. There is no conscious effort to force the shoulder into the recoil pad. The shoulder simply wraps around the buttstock. I have learned through extended practice sessions shooting 300 grain bullets that applying pressure with the shoulder and inconsistent placement of the buttstock in the shoulder pocket causes fliers, typically horizontal. As when I was shooting 6.5, my right hand exerts no grip on the pistol grip other than to facilitate use of the trigger finger.

The Pachmayr XLT recoil pad is a marvelous and welcome addition to the rifle. Although recoil is stout, shooting sessions where 100 or more rounds of 300 grain bullets are fired have been manageable.

Continued on next page





Torque Tamer

Continued

There are no return-to-battery issues when shooting calibers in the "3's." The Torque Tamer tracks as well as my MBR when I shot 6.5. When I shot 250 grain bullets with the MBR, the torque and recoil were so violent that I sometimes could not regain the sight picture fast enough to see the bullet impacts on the sighter bank at 1000 yards. I have had no problems in regaining the sight picture in time to see the impacts of 240 grain bullets at 1000 yards. When I am shooting 300 grain bullets at 1/4 inch target circles at 100 yards, the scope dot typically returns to at least the periphery of the circle, if not the center. In terms of torque, I can sense a very slight tendency to "twitch" a hair counter clockwise when shooting 300 grain bullets, but this does not affect return-to-battery.

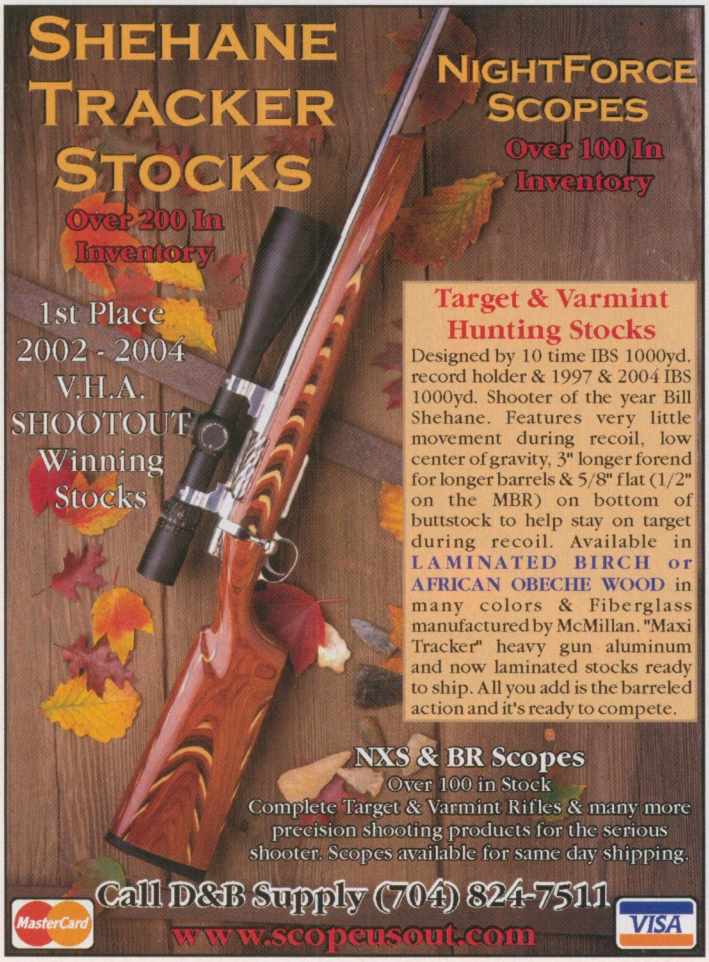
I can sense no torque when shooting 240 or 210 grain, 30 caliber bullets. In contrast, the torque sensation when shooting 250's with a regular MBR was very pronounced. I used to remark that the torque was so bad with this bullet/stock combination that I felt I was being rolled into the bench to my left. (Refer again to Figure 1). Folks to my left can now breathe easier, as I will not be dropping in for an unscheduled visit during my record string.

During the 2007 season, I shot eight light gun 1000 yard bench rest matches. Six of the matches were shot using 240 grain bullets at a muzzle velocity of 3120 fps. There were no torque or return-to-battery issues, and I had no problem seeing sighter impacts at the 1000 yard bank.

I shot two of the matches with 210 grain bullets. Shooting this bullet was like shooting a pop gun in comparison to shooting the 240, 250, and 300 grain bullets. As with the 240's, there were no return-to-battery issues, and no torque could be sensed.

My best six target group aggregate was 5.93 inches. Figure 11 is a picture of "one that got away." Three of the shots were .520 inches center to center, four of the shots were 1.825 inches, and the 5th shot opened the group out to 5.318 inches. Every one of us has at least one target with a similar story, but I suspect very few could tell the same story using 240 grain bullets traveling in excess of 3100 fps from a 17 pound light gun. In my opinion, the Torque Tamer stock has made the possibility of consistent, truly impressive groups from a "heavy" bullet in the "3" calibers a reality, Tom Sarver's light gun record group notwithstanding. Figure 12 is a picture of a 1000 yard Screamer group of 3.995 inches, fired using 240 grain bullets.

I am convinced that the flier in Figure 11 is due to a different placement of the stock in the shoulder, brought about by me fighting the front rest for a comfortable placement of my left arm. Based on the inferred flier in this group, I had the notch installed in my front rest, as shown in Figure 11. The Screamer



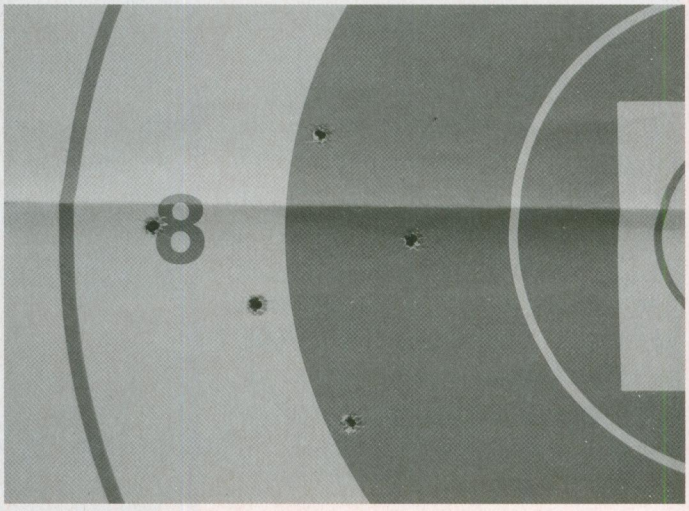


Figure 12.

group shown in Figure 12 was shot after this notch had been fabricated.

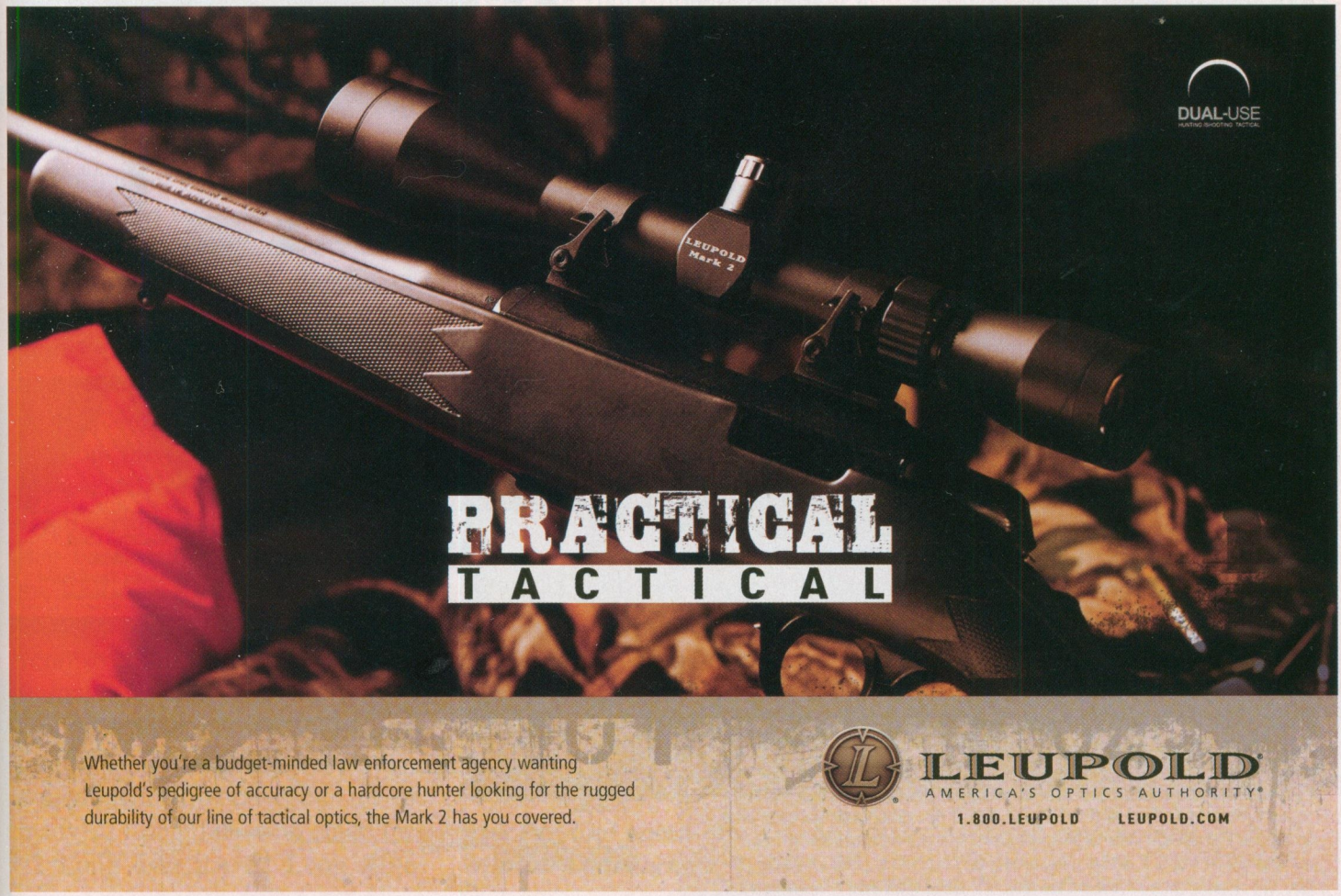
CONCLUSIONS

Based on the target results and experience obtained during the 2007 season, the following conclusions can be made:

- Off-set stocks are a viable method to resist the torque generated by the bullet's acceleration down the barrel.
- No return–to-battery issues were experienced shooting calibers in the "3's" when using the Torque Tamer stock.
- Use of the Torque Tamer stock allowed shooting techniques approaching that of free recoil to be successfully implemented.
- Based on my success with my "modified free recoil" shooting technique, a front rest similar to a Farley rest could conceivably be used in conjunction with a Torque Tamer stock.
- Positioning the rifle forward on the front bag and refinement/ modification of the shooter's current technique may be required to extract the true performance potential from the Torque Tamer stock.
- Based on torque estimates presented in Table 1, the Torque Tamer stock provides no benefit when shooting calibers in the "6's."
- The Torque Tamer stock is sufficiently stiff to accommodate the weight of an unfluted, 1 inch muzzle diameter, 30 inch long barrel and 8 1/2 inch BAT action.
- The available front bag allows use of the Torque Tamer stock with most existing front rests.
- Use of the Torque Tamer stock makes the possibility of shooting consistent quality groups and scores at 1000 yards with calibers in the "3's" a reality.

SHAMELESS SALES PITCH

Un-inletted and unfinished Torque Tamer stocks are for sale at $350 plus shipping. American walnut stocks typically weigh less than 4 pounds, and English walnut or butternut stocks typically weigh less than 3 pounds. Four inch wide bags made by Edgewood are available for $65 plus shipping. You can contact Dave Tooley at 704-864-7525 to place your order.

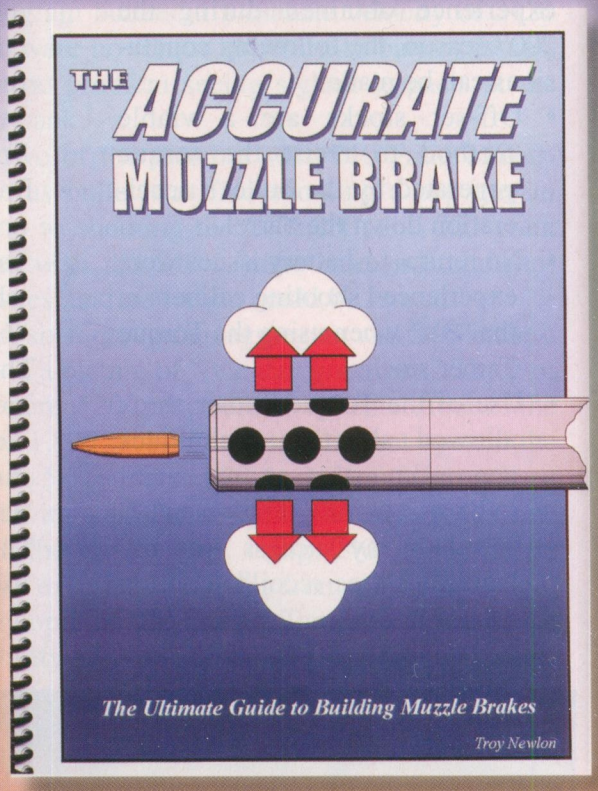


Our latest book offering...

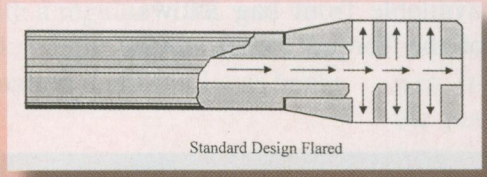
The Accurate Muzzle Brake

The Ultimate Guide to Building Muzzle Brakes

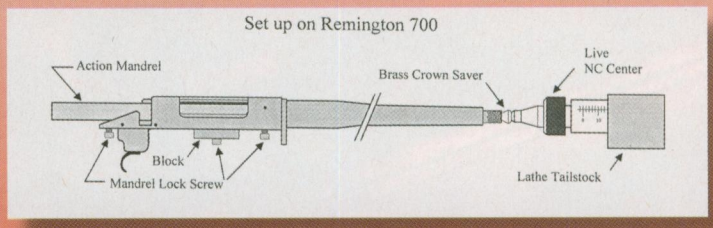
By Troy Newlon



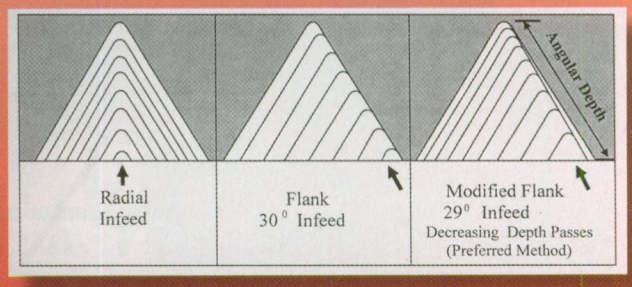
Some time ago Troy Newlon (a **PS** advertiser) gave us an advance look at the book manuscript that he was just wrapping up, *The Accurate Muzzle Brake*. For a first attempt at authoring a how-to book it was quite remarkable. The book is spiral-bound, so that it will lie flat on the shop's workbench. The pages are coated so that if and when the inevitable day arrives that you spill some liquid on the pages it can be wiped off with a minimum of cussin' and mumblin'. The contents, both the narrative and the illustrations, are top notch and guide the reader from start to finish on just how to build muzzle brakes of various types and applications.

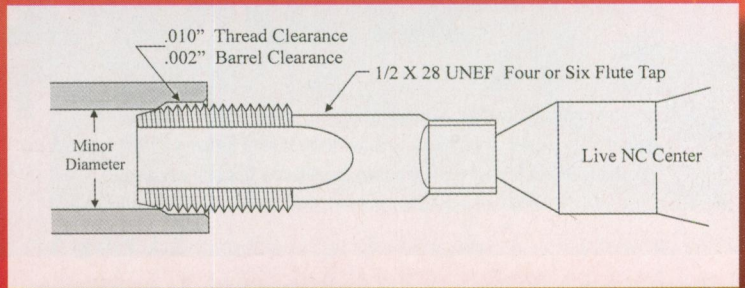

Standard Design Flared

A few of the chapter titles are informative as to the book's contents: How Muzzle Brakes Work...Muzzle Brake Design (Hole Patterns & Hole Diameters, Exit Hole)...Accuracy (Crowning the Muzzle Brake, Muzzle Brake Steel, Indexing the Brake, Job Set-Up, Crown Savers)...Building the Brake (Tooling Set-Up, Threading the Brake, Tapping on Center, Milling & Drilling Hole Patterns)...Threading the Barrel (Turning the Thread Diameter, Set-Up for Threading, Types of Infeed, Angular Depth Threading, Calculating Angular Depth, Thread Inserts, Thread Fit and Classification, External/Internal Thread Dimensions), Muzzle Brake Accessories.



Troy Newlon is a master machinist and remarkably he seems to be equally good as an instructor. When we took delivery of the finished book we told Troy that he would have to be mad to stop with just one book. We could envision a series of 10-12 books on topics that are critical to the new would-be gunsmith or advanced hobbyist. Troy retired back to the Bat Cave to think this over but we hope that he doesn't spend a lot of time thinking about authoring a book series that will fill a very large demand. **PS** will certainly carry the series for sale, I can guarantee that.





ORDER NOW: at $24.95. **Order from:** Precision Shooting, 222 McKee Street, Manchester, CT 06040. Shipping and Handling in the US is $3.50 for first book and $5.00 for multiple book orders. Foreign orders (including Canada) will be shipped economy mail unless air is specified and will be charged actual shipping costs plus $1.00 for handling. Visa or Master Card orders accepted without surcharge at our CT office. (860) 645-8776 phone; (860) 643-8215 fax. CT residents add 6% sales tax; NY residents add 4% sales tax.

CARTRIDGES WORTH WATCHING

BY DON LEWIS
PHOTOS BY HELEN LEWIS

The plethora of new cartridges now available in both factory and wildcat versions is almost mind boggling. If the old standbys such as the 22 rimfire, 22 Hornet, 220 Swift, 270 Winchester, 30-30 Winchester, 300 Savage, 300 H & H Magnum, 32 Special, 348 Winchester and 35 Remington are performing to a high degree in the field, why is there such a demand for new cartridges? Is there really a demand, or is the avalanche of new cartridges just a sign of the times?

A short walk back through hunting history may shed some light on the performance of a few of these ol' timers and what brings about cartridge development. Let's step back to the late 1880s when the 22 Long Rifle cartridge made its debut. There is some controversy over this cartridge and how it started life, but it is fairly well established that it started life using the 22 Long case. This revelation will undoubtedly raise the ire of many 22 Long fans who claim the 22 Long uses the 22 Long Rifle case and the 22 Short's bullet. Without going into a lot of detail, the 22 Long is more than 15 years older than the 22 Long Rifle cartridge, and that fact does lend credence to the belief that the Long Rifle used the Long's case. Stevens Arms and Tool Company brought it out in 1887, and it was a winner right from the start. It is still one of the most popular cartridges on the market today. With proper bullet placement, the 22 Long Rifle is capable of stopping woodchucks and other small varmints up to 80 yards, but I believe it is wiser to not exceed 50 yards.

I've seen ads over the years claiming certain 22 Long Rifle ammo was effective on woodchucks up to 100 yards, but I question that.

Continued on next page

Jim Peightal points to safety on author's Mach 2 rimfire built on a Martini Cadet action.

Cartridges Worth Watching

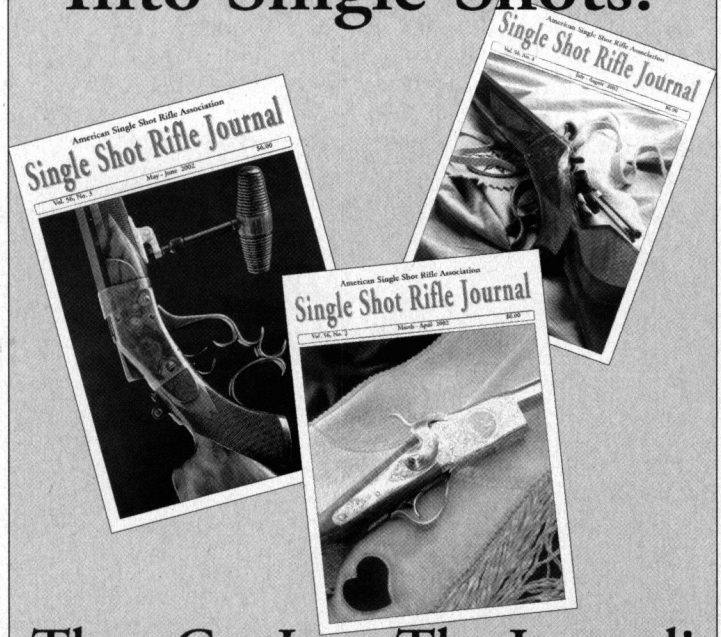
Continued

My field tests some years back with the 22 Winchester Magnum and Remington 5mm Magnum showed 130 yards to be the effective killing range on large woodchucks for these cartridges, and they produced muzzle velocities in the 2,000 fps range.

The 22 Long Rifle cartridge has reigned for well over 100 years, and it is still holds the honor of being the most widely used small game hunting cartridge (this includes all types of varmint and pest shooting) and is still the number one match cartridge. Even though it is being challenged today by the 17 Hornady Magnum Rimfire and Hornady Rimfire Mach 2 cartridges, it is in no danger of being replaced soon.

The 22 Short is the oldest American self-contained cartridge that is still going strong after more than 149 years. That's quite a testimony. Some ammunition makers have dropped the 22 Short, but several major firms still produce the old 22 Short, and I doubt if it's in danger of disappearing.

Into Single-Shots?



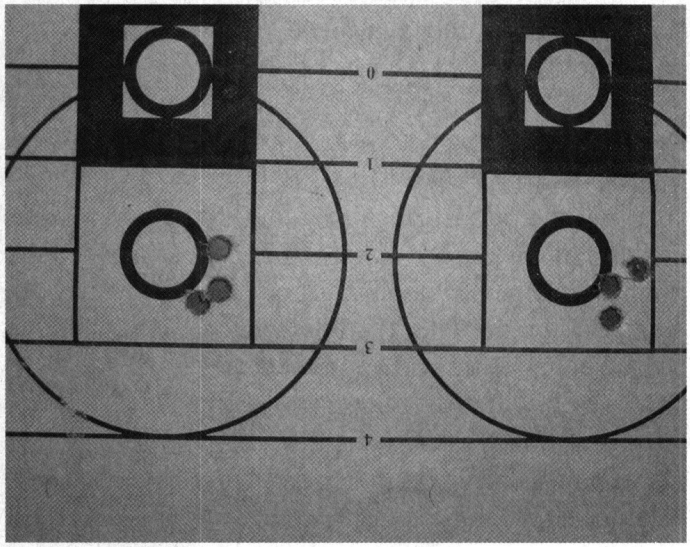
Then Get Into The Journal!

THE single-shot authority since 1948! Color covers and over 60 pgs. devoted to single-shot rifles and classic shooting, bi-monthly. World-class writers, gunsmithing, loading techniques, history, match reports, and purveyors of the finest equipment. It's a "must read" for enthusiasts. A $35 annual subscription includes membership in the American Single-Shot Rifle Association and a wealth of benefits. Subscribe/join, contact:
Keith Foster, ASSRA, (419) 393-2976 e-mail kafos@defnet.com
Or join on the web! Visit www.assra.com

There's no point in trying to name all the early cartridges and the dates they appeared, but the 30 Army (30-40- Krag) came along around 1892. It holds the distinction of being the first small-bore U.S. military cartridge. Three years later in 1895 Winchester's 30-30 was offered in Winchester's 1894 lever action carbine. Its name is derived from its makeup of 40 grains of smokeless powder and a 30 caliber bullet. The Krag's action is smooth, and that's putting it mildly. During more than 50 years of rifle shooting, I have never encountered a bolt that worked as smooth as the Krag's.

The 30-30 is the first American small bore smokeless powder sporting cartridge. While it is no powerhouse or tack driver, it still is immensely popular in the U.S.A. and many places around the world. I read some years back that the 30-30 (up to that time) had killed more deer in Pennsylvania than all other big game cartridges combined. I think it's safe to say that all American firearm companies chamber for the 30-30. Like the 30-40 Krag, the 30-30 derives its name from its original loading of 30-grains of smokeless powder and a 30 caliber bullet. That terminology was used to describe black powder cartridges such as the 45-70 which was a 45 caliber using 70-grains of black powder. I'm not certain why it carried over to some of the early smokeless powder cartridges.

The 1903 Springfield, which had a very short military life as a replacement for the 30-40 Krag, used a 220-grain round nose full metal jacket bullet. In



6.5 x 47 Lapua 001. Two 100 yard targets fired by Peightal with the author's 6.5 x 47 built on a Remington 700 Short Action using a 3-Groove Benchmark barrel.

1906, another 30 caliber was adopted by the military. It used a lighter bullet with a spitzer-type bullet design. It was not only a success for the military, it won the hearts of hundreds of thousands of American hunters. Older hunters (fast disappearing) refer to it as the "ought-six". The old cartridge has faced dozens of challengers, but it's still one of the finest big game cartridges on the market today. A friend of mine has killed 23 moose, 40 white-tail bucks and 30 anterless white-tails with his Remington Model 721 bolt action "06". Quite a testimony.

I won't dwell too much on the 17 Hornady Magnum Rimfire which Hornady introduced in 2002 with its higher velocity. It definitely has an edge on the 22 Winchester Magnum Rimfire which has been around for many years. The 17 HMR has a muzzle velocity around 2,550 fps which is about 500 fps faster than the 22 WMR. The additional velocity unquestionably gives the HMR more range. Its extra velocity offers a flatter trajectory and less wind drift. Another plus for the 17 HMR is its 17-grain jacketed V-Max bullet with a polymer tip, that produces dramatic expansion, is less likely to ricochet than lead bullets used in 22 caliber rimfires. Even though the 17 HMR is the fastest rimfire cartridge available, it's not exactly a super long range cartridge for larger varmints such as woodchucks and coyotes. I think the 17 rimfire HMR cartridge has a maximum effective range in the pasture fields of under 200 yards. However, the 17 HMR is a good cartridge and certainly has a place in today's varmint hunter's arsenal.

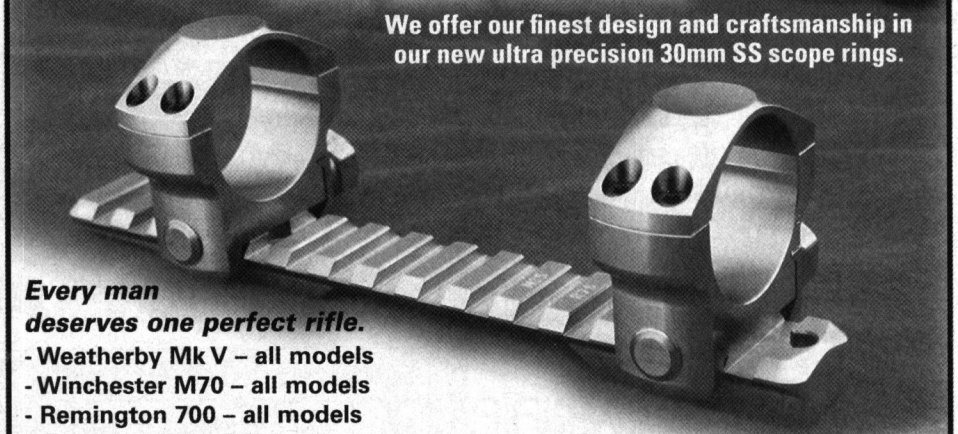
Hornady's 17 Mach 2 rimfire cartridge has all the requisites to be a top squirrel cartridge. There's no question it out performs the 22 Long rifle cartridge in practically all categories in the hunting realm, but I doubt if it will ever achieve the accuracy of 22 rimfire target ammo. Jim Peightal built mine on a Martini Cadet action. My action didn't have a safety, but I designed a cross bolt that locked the trigger. Pushing the external lever down turned the cross bolt about a fourth turn to a slot in the bolt. The slot in the bolt allowed the trigger to move back enough to release the sear.

The 17 Mach 2 pushes a 17-grain Hornady V-Max polymer-tipped bullet out of the muzzle around 2,000 fps, or about the same speed as the Winchester 22 Magnum. The polymer tip aids in accuracy but is also designed for dramatic expansion causing the bullet to literally disintegrate on impact. This type of bullet seldom ricochets, and this is important to

Continued on next page

Factory 5.4 x 47 cartridges 108 grain Scenar Lapua bullet.

Hornady Mach 2 17 caliber rimfire cartridges.

NEAR MANUFACTURING SCOPE MOUNTS
Rock Solid Precision
We offer our finest design and craftsmanship in our new ultra precision 30mm SS scope rings.

Every man deserves one perfect rifle.
- Weatherby Mk V – all models
- Winchester M70 – all models
- Remington 700 – all models
- Savage - all models
- SAKO TRG-21/22/41/42 & M995 TRG-S

NEW - SAKO M75 #3 & #5

The same precision is crafted into our bases. Flat, 10 MOA, 25 MOA and 60 MOA of taper in SS or matte black.

Call Toll Free 1(866) 608-2441 www.scopebases.com

Cartridges Worth Watching

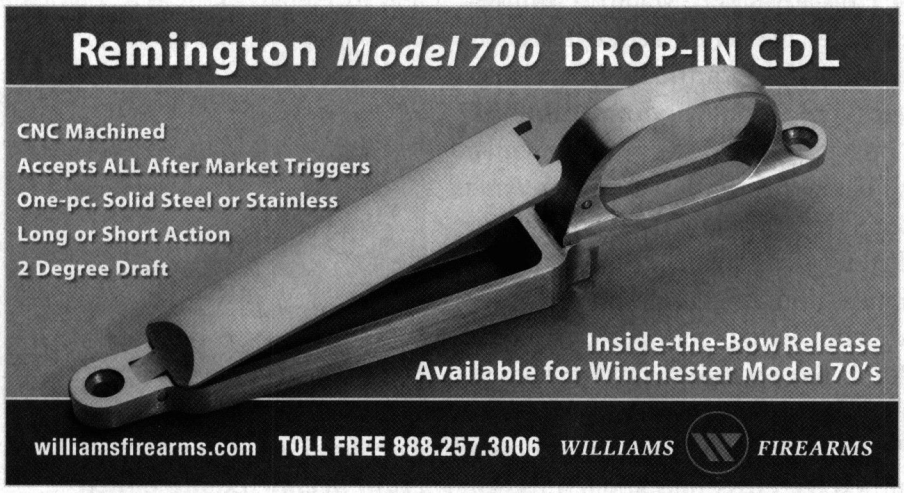
Continued

squirrel hunters. When hunting in small woodlots close to farm buildings, the whining sound of a bullet ricocheting is unnerving even though it might not pose any danger. With the 22 Long Rifle cartridge, this is a common experience if a bullet strikes a limb or a hard surface.

The Mach 2 might not compete in the accuracy column with 22 target cartridges, but my tests on the 50-yard range left no doubts in my mind that the tiny bottleneck 17 caliber cartridge is more than adequate for squirrel shooting. Most 3-shot groups stayed under 1/2-inch, and that means precise bullet placement which squirrel hunting is all about. Some rimfire actions can be rebarreled to the Mach 2, and it's best to stick with a twist of one turn in nine inches.

It may sound somewhat unnecessary to bring out what might be called a "combination" cartridge, but the Lapua's 6.5 x 47 comes pretty close to being just that. This petite.264 caliber cartridge has all the requisites to hunt woodchucks and prairie dogs at long ranges, or tackle black bear and white-tailed deer in big timber country. I have learned from the two 6.5 x 47 Lapuas built by Jim Peightal that is precisely what Lapua claims – a cartridge designed primarily for long range competitive shooting with a high degree of accuracy. Lapua's ballistic sheet shows muzzle velocities hitting 2,950 fps with a Lapua's 108-grain Scenar bullet. That type of velocity qualifies it in every way for long range varmint shooting. Stepping up to the 123-grain Scenar bullet, velocity is still high at 2,790 fps, and the 139-grain Scenar exits the muzzle at 2,690 fps. Both the 123-grain and 139-grain bullets are ideal for white-tail deer and black bear. It can easily be seen that the 6.5 x 47 Lapua cartridge has similar ballistics to the Remington 25-06, and the 6.5 x 47 does not produce as much recoil. It seems to me this new cartridge is exactly what many big game hunters, both young and old, would enjoy shooting. I also think it's an ideal cartridge for lady hunters.

At the moment, I haven't heard of any American gun builders chambering for the 6.5 x 47, but rest assured, it won't be long. Peightal built two—one for deer and one for varmints. He used a Remington 700 short action with a 3-groove Benchmark barrel with a 1 in 8 1/2 twist on the deer outfit. For the heavy barrel varmint rig, he used a Model SEVEN Remington action and a Shaw barrel with a 1 in 9 twist. The outside of the Shaw barrel has spiral flutes which



5 GOOD REASONS TO SHOOT A SHILEN.

- 2006 N.B.R.S.A. Sporter Class National Champion and I.B.S. Four-gun National Champion – Wayne Campbell
- 2006 Supershoot – Heavy Varmint Champion – Kent Harsham
- 2006 Supershoot – Light Varmint Champion – Jeff Summers
- I.B.S. World Record – Light Varmint – 200 yard small group, 0.091" David Farrar, May 2006
- N.B.R.S.A. World Record – Light Varmint – 300 yard small group, 0.291" Brady Night, August 2005

SHILEN RIFLES, INC
World Class Accuracy Since 1955

Shilen congratulates the gunsmiths and shooters that have made our barrels winners for over 50 years.

www.shilen.com 972.875.5318

gives it a classic look. Range tests with both factory ammo and reloads were impressive. From both rifles Peightal's 100 yards 3-shot groups seldom strayed much beyond a half inch between the two widest shots. At 200 yards, most groups printed within the one-inch bulls eye. That's suitable accuracy for all types of woods and field shooting.

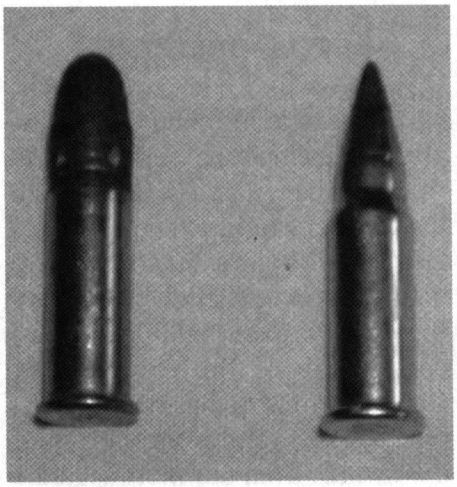
I'm convinced the 6.5 x 47 will be around a long time, and I don't think it will be exclusively a competitive cartridge. With sizzling velocities and literally pinpoint accuracy, the 6.5 x 47 Lapua is also a super hunting cartridge.

I will simply mention the 6.5 Creedmoor from Hornady. The reason I am only mentioning it is because I have never seen the cartridge and I don't have a rifle chambered for it, although Peightal and I are in the process of building a Creedmoor. Here are a few things I do know about this new cartridge from Hornady.

It has a 308-size case which is 1.920-inches long from its base to mouth. It has a 30-degree shoulder angle and uses a large primer with a larger flash hole. It has minimum body taper. Chamber pressure with factory ammo is under 60,000 psi. Although primarily designed for competitive shooting, it will also be more than adequate for medium-size big game. Like the 6.5 x 47 Lapua. It will also satisfy a lot of long range varmint shooters. Literally any standard .308 action can be rebarreled to the Creedmoor which means a lot of work for gunsmiths and rifle builders. It should be widely accepted by both competition shooters and hunters.

I haven't covered all the new cartridges that have appeared during the last five years, but the ones in this article bear watching. Time will tell the ultimate story, but I'm pretty much convinced these new entries are here to stay.

Jim Peightal
Ernest, PA
(724) 349-5216



22 Long Rifle rimfire cartridge (L) – Hornady Mach 2 (R).

Puff-Lon
Quality Products
LUBRICATING BALLISTIC FILLER
SINCE 2001
LESS CLEANING MORE CONSISTENCY
ALL NATURAL (NO SYNTHETICS)
500 CC $25.95 PLUS $4.00 S&H
1500 CC $54.95 PLUS $6.00 S&H
FIRE LAPPING BALLISTIC FILLER
"BORE POLISHING KIT"
FOUR OPTICAL GRADE POLISHERS
$49.95 PLUS $6.00 S&H
WORLDS BEST HOUSEHOLD OIL
SINCE 2007
CONTAINS: TEFLON® SOLIDS
AND RUST INHIBITORS
1.25 OZ $9.95 PLUS $4.00 S&H
TO ORDER or QUESTIONS CALL: 800-369-4518
www.pufflon.com 344 LCR 759, Groesbeck, TX 76642

UNDERSTANDING THE BULLET'S FLIGHT THROUGH CROSSWINDS PART I

BY JAMES A. BOATRIGHT

INTRODUCTION

This article is an attempt to explain some important aspects of the modern rifle bullet's flight through the atmosphere in straightforward English without using very many mathematical equations. I hope to provide a broader and deeper understanding of the complex in-flight motions of our best match-type bullets fired through real crosswinds from our most accurate target rifles. This work follows on where my last article, "Understanding Wind Drift," in the December 2007 issue of *Precision Shooting* left off. In that article we discussed 1) horizontal wind drift due to crosswinds; 2) the observed secondary, vertical bullet impact displacements due to purely horizontal crosswinds; and 3) the well known long-range, horizontal drift related to the spin direction of the bullet. These effects were discussed as if our bullets always flew straight, point-forward through the air. We did explain how the rapidly clockwise spinning bullet, acting similar to a toy gyroscope, always moves its spin axis at right angles to any overturning moment (torque). It is not much of a stretch for us to realize that those motions could continue on around and become a clockwise gyroscopic precession-like "coning" motion. In fact, during the period while I was writing that earlier article, I still thought that the bullet's coning motion actually *was* gyroscopic precession, with a gyroscopic nutating motion superimposed, as has been the common wisdom for many years. After studying the problem for several months, I have concluded that the coning motion of a bullet is no more than a cousin to gyroscopic precession. We shall examine the causes and effects of this coning motion in some detail, including revisiting the explanations of the three observed ballistic phenomena discussed in the earlier article. We will also indicate why we went to so much trouble in the *Precision Shooting* articles on "The Well Guided Bullet" in September and October 2006 to explain how to launch our precision-made, long range match bullets with the least possible amount of in-bore yaw.

We will discuss some details of the measured flight characteristics of the old 30 caliber Sierra 168 grain International bullet, the direct ancestor of today's 168 grain Sierra MatchKing bullet. The only reason that we know anything about this obsolete bullet is that the Ballistics Research Laboratory (BRL) at the US Army Aberdeen Proving Ground in Maryland measured and documented the flight characteristics of this and other match bullets back in the 1980's. We will switch from using the old US Army standard METRO atmosphere to the International Civil Aviation Organization (ICAO) standard atmosphere used by BRL in these bullet studies. The data, formulae and information used in this study predominantly come from ***BRL-MR-3733, The Aerodynamic Characteristics of 7.62MM Match Bullets***, December 1988, by Robert L. McCoy and from his important book, ***Modern Exterior Ballistics***, 1999, Schiffer Military History, Atglen PA. The BRL Memorandum Report is freely available online at http://stinet.dtic.mil/. Robert L. McCoy's ballistics book (often simply referred to as the MEB) is currently available for $95 at www.schifferbooks.com. I believe my ideas about bullet behavior in flight to be congruent with the observations and, for the most part, with the conclusions of Dr. Franklin W. Mann as documented in

his *magnum opus* of 1909, ***The Bullet's Flight From Powder To Target***, which only became comprehensible to me as I thought more deeply about the bullet's coning motion and as I learned to interpret his fluently used nineteenth century syntax. I will include several relevant quotes from ***The Bullet's Flight*** so that you can see what I mean. Even working more than a century ago, Dr. Mann has still studied bullet motions in flight more extensively and more intensively than has any other person, before or since.

This article is largely an attempt to explain what has been known for years in new and more understandable ways and is not reporting any new research. I will start in Part I of this study by describing the standard analytical formulations for the major forces and moments affecting the bullet and for the epicyclic motions of its pointing directions in flight. I will present the analytic formulations used at BRL, as documented by Robert L. McCoy, in Chapters 10, 11 and 12 of his book. These formulations are simplified, "linearized" versions of the full equations of motion that would be used in a 6-degree-of-freedom (6-DOF) computation of a projectile's motions in free flight. One of the simplifying assumptions used in these chapters is that there is no wind of any kind, so that air drag is due to bullet velocity alone. I will end Part I with an introduction to the serious "excessive lift problem," that cannot be resolved within the standard formulation.

Then, in Part II, I will discuss at length the bullet's "coning motion" at the heart of a new formulation for bullet motion in flight. This discussion will include perhaps some new insight into the dynamics of this coning motion as a ***lift-force driven, isotropic harmonic oscillator***, and why the axis of this cone is constantly driven to point directly into the eye of the apparent wind throughout the bullet's flight. I will include a discussion of the important "excessive lift problem," and how it can be addressed within the new formulation, presented here. I will elaborate upon the subject of how we know that coning motion really must occur with each rifle bullet fired. And, finally, I will define, an equivalent "virtual bullet" that flies along the mean, point-mass (3-DOF) trajectory, but without coning, and is oriented point-first into the air-stream. This virtual bullet concept validates the coordinate system centered on the moving center of mass as used by BRL and most other ballistics researchers. As fringe benefits of all of this rigmarole, we gain what may be perhaps the first logically consistent explanation of how the bullet's pointing direction "tracks" the downward-curving trajectory, and we can establish what I believe to be the first formal metric defining the minimum possible group size in a given target match.

PART I. THE STANDARD FORMULATION

FORCES AND MOMENTS

The major forces and moments acting on our example 30 caliber, 168 grain, Sierra International bullet are calculated at 100 yard range intervals from the muzzle to 1000 yards. The bullet is launched at 2600 FPS into a sea level ICAO standard atmosphere with a pressure of 760mm, or 29.92 inches, of mercury, a temperature of 59 degrees Fahrenheit, and zero humidity, for an air density of 0.0764742 pounds per cubic foot. This bullet performs the typical fast-mode and slow-mode epicyclic pointing motions, as measured in the Spark Photography Range at the BRL. And Robert L. McCoy was able, by finding suitable *initial conditions*, to duplicate these epicyclic motions numerically using a 6-DOF computer model for this bullet. These major forces and moments are calculated based on BRL data, using their standard analytical formulations, and are given

Continued on next page

GRACEY CARTRIDGE CASE TRIMMER
"An Integral Part of the Champion's Competitive Edge!"
GRACEY CASE TRIMMER MATCH PREP
Doyle Gracey
21204 Carriage Drive
Tehachapi, CA 93561
661-822-5383 Phone
661-823-8680 Fax
www.matchprep.com
gracenotes@as.net
• Trims, chamfers and deburrs in one operation.
• Registers on the shoulder of the resized case.
• Can trim 500 cases per hour.
• Case holders in stock for most bottleneck cases.
• New 50 Caliber Trimmer now converts to standard calibers.
ASK ABOUT OTHER GRACEY PRODUCTS!

Understanding The Bullet's Flight..., Part I

Continued

for certain key ranges in Table 1, Forces and Moments.

AIR DRAG FORCE

In the standard formulation, the size of the *drag force*, acting to retard the forward motion of our example bullet at any point in its flight, is calculated as the product of the *dynamic pressure* exerted by the atmosphere on the bullet at their relative velocity, times the bullet's *cross-sectional area*, times a suitable *coefficient of drag* (**CD**) value. The dynamic pressure is one half the mass density of the atmosphere times the square of the bullet's velocity through the air. When multiplied by the cross-sectional area of the bullet, this dynamic pressure yields a kind of maximum potential dynamic force that might retard a "non-streamlined" bullet. This potential dynamic drag force (**DYN**, in pounds) is incorporated into the drag computation by BRL for several good reasons:

1) The dimensions and units work out correctly to yield a meaningful force.
2) The explicit dependence upon atmospheric density allows us to correct for subsequent variations in that parameter.
3) This "straw-man" drag force can be multiplied by a particular value of a dimensionless coefficient of drag **(CD)** value to produce the actual measured drag force in a given set of conditions.
4) The **CD** values for a given bullet can be specified as a complicated function of several flight variables, including the bullet's Mach number and its total angle of attack **(a)**.

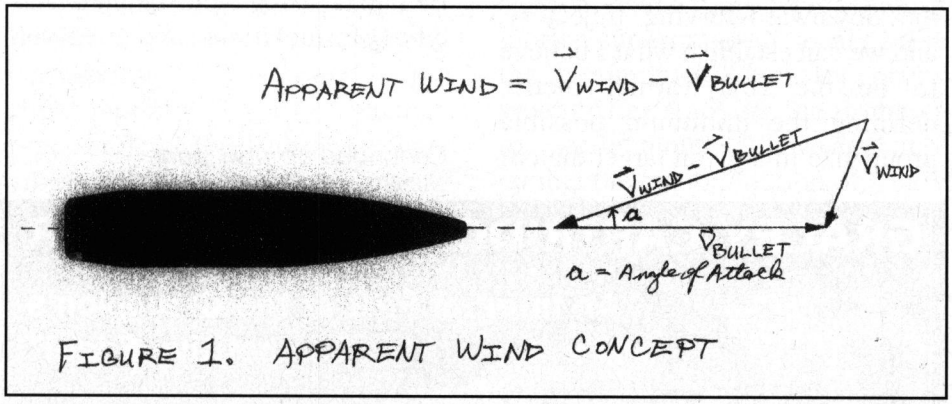


FIGURE 1. APPARENT WIND CONCEPT

This well proven approach to modeling the mathematics of a complicated physical function is used by BRL in accordance with standard practices often used in engineering. We should point out that the actual drag force experienced by the bullet interacting head-on with the ambient atmosphere at supersonic speed comprises several different types of drag forces that can be analyzed separately: 1) nose, or ogive, drag, 2) skin friction, and 3) base drag. Spark shadowgraph photography of actual bullets in supersonic flight show beautiful images of several conical shock waves and boundary layers of laminar and turbulent flows.

The coefficient of drag **(CD)** for a given bullet is a function that varies significantly with the bullet's Mach number (bullet speed divided by the speed of sound, or 1116.45 FPS for our sea level ICAO atmosphere) and increases very slightly with the angle of attack **(a)** of the bullet in flight. As shown in Table 1, the actual drag force (in pounds) on our example bullet *decreases continually* throughout the supersonic portion of its flight even though the **CD** values are *increasing* as the bullet slows. The drag force on the bullet in supersonic flight only varies approximately with the *three halves power* of the velocity of the bullet through the air. It is important to note that the ***direction*** of the aerodynamic drag force does ***not*** depend in any way upon the free-flying bullet's *attitude*, or orientation in space. By definition, air drag always acts in a ***downwind*** direction, which means ***in the direction of apparent motion of the undisturbed local air mass as seen from the perspective of the moving bullet itself at any instant during the flight***. The

Bart's Custom Bullets
821 Phelps Johnson Rd., Leitchfield, KY 42754
SHOOT WELL - SHOOT BART'S
6MM Bullets: "Original", "The Wedge" or the "Ultra"
in 66 or 68 grs. 22 Caliber Bullets in 52 grs.
Price: $230.00* per 1000
*prices can change without notice
Place orders by calling (270) 879-4279 or email
The6ppc@aol.com www.BartsBullets.com

drag force on the bullet and the weight of the bullet are the only two forces used in the commercially available trajectory programs, such as Sierra's Infinity software package, to compute the bullet's three-degree-of-freedom (3-DOF) trajectory.

APPARENT WIND CONCEPT

A good way of defining the direction in which the drag force acts is to re-introduce the concept of the "apparent wind direction," as mentioned in the previous article. Referring to the diagram in Figure 1, we can determine the ***apparent wind velocity vector*** at any instant during the bullet's flight by forming the vector difference: ***true wind velocity minus bullet velocity***. These two instantaneous wind and bullet velocity vectors are each three-dimensional vectors specified in the same earth-fixed coordinate system. The resulting three-dimensional apparent wind velocity vector is with respect to the moving bullet. Note that the instantaneous direction of the *bullet's velocity vector* completely defines the principle direction (origin) of the "wind axes" in the standardly-used coordinate system centered on the bullet's mean center of mass (or gravity, MCG), which moves along the 3-DOF trajectory with the bullet. ***The drag force vector acting on the bullet is in the direction of the apparent wind velocity vector***. If there truly is ***no wind***, e.g., when firing in an indoor range such as the BRL Spark Photography Range, ***the apparent wind is the same as the negative of the bullet velocity vector***. And, since all BRL data on bullets in free flight is collected in this way, this "no wind case" is exactly why all known diagrams of bullet pointing motions have shown epicyclic patterns ***centered***

Continued on next page

ROBERT W. HART & SON, INC.

HART PRODUCTS

Group measuring device	$67.95
Bullet puller 6-22-30 cal	$19.77
Bullet puller 17-25-270 cal	$19.77
Bullet puller 6/5-5-7-.338 cal	$19.77
Bolt holster w/flap	$36.02
Arbor press right/left hand	$137.87
Comp I front rest/bearing/bag	$233.99
Comp II front rest/bearing/bag	$238.99
1000 yd rest w/comp 3 top/base plate/stop	$581.99
Comp II top with stem	$73.47
Shooters portable wooden bench	$288.95
Lt Wt Rem Adl trigger guard 1/2 oz	$35.90
Pill bottle adapter REDDING	$23.29
Pill bottle adapter LYMAN	$23.29
Pill bottle adapter HARRELL	$23.29
One piece scope rings 1" & 30 mm	$75.99
Primer pocket depth reamer LG or SM	$21.81
Primer pocket depth reamer (carbide) L & S	$24.30
Neck turning tool (your choice caliber)	$135.75
2 oz trigger	$183.19
Bolt stop 1 piece Blued or SS	$10.88
Bolt stop 2 piece spring loaded BL/SS	$21.81
Acrylic drop tubes 3"-6"-10" Lyman	$10.08
Acrylic drop tubes 3"-6"-10" RCBS/RED	9.58
Acrylic drop tubes 4"-6"-8"-10" Harrell	4.50
1/4" Hex head style case tools:	
Case neck irons (rifles & pistols)	$10.39
Internal flash hole deburrer LG & SM	$20.72
Primer pocket depth reamer LG & SM	$21.81
Primer pocket cleaner	$20.16
Hand held primer pocket cleaner	$12.22
Accessory handle for neck brush	$4.40
Brush & Jag pliers	$8.66
Action wrench	$54.10
Screwdriver set (26 tips)	$31.78
Barrels 1.250" under 26"	$295.00
Brass core rifle brushes (dozen)	$10.08
Cleaning patches 1 3/4" square (1000)	$11.76
Cleaning paches 2" square & round (1000)	$14.14
Case holder using REDDING shellholders	$29.99
Accuracy Asset	$37.95

SAND BAGS FRONT & REAR - PROTEKTOR

#1 Front bag/hunting rifle style	$17.65
#2 Front bag (2 1/2") Competition style	$17.65
#3 Front bag (3") Competition style	$17.65
Small Brick bag	$14.77
Large Brick bag	$18.69
Heavy Bottom rear bag (Bunny or Rabbit ear)	$29.47
Custom high rear bag (Bunny or Rabbit ear)	$41.36
Owl ear 1000 yd front bag (5" & 6")	$29.95
Zircon sand 15 pound bag	$16.50

SCOPES

LEUPOLD: All models	call for pricing
LEUPOLD: Rings & bases	call for pricing
WEAVER: All models	call for pricing
WEAVER: Bases (all styles)	call for pricing

HARRELL POWDER MEASURES

CULVER Premium 6 gr - 120 gr	$245.00
CULVER Benchrest premium 6 gr - 60 gr	$220.00
CULVER Custom 90 6 gr - 90 gr	$180.00

REDDING RELOADING EQUIPMENT

Ultra mag press	$230.40
Ultra mag kit including your choice Series A dies	$261.00
Boss Press	$101.70
Boss kit including choice Series A dies	$132.30
Turret Press T-7	$221.40
Turret Press T-7 including choice of Series A die	$252.00
We carry all REDDING dies & accessories - call for prices	

L.E. WILSON

Bullet seaters (most calibers)	$36.83
Neck sizing die (most calibers)	$36.83
Neck die bushings	$11.36

STONEY POINT

Bullet Comparator body	$14.23
Bullet Comparator inserts	$3.58
OAL gauge straight	$35.65
OAL gauge curved	$38.75
Modified cases (most calibers)	$6.06
Bore Guides .17 - .25 or .25 to .30	$24.94

CALL OR EMAIL: sales@rwhart.com
FOR FULL LINE CATALOG.

VISIT OUR WEBSITE: wwwrwhart.com
FOR NEW PRODUCTS.

OUR CATALOG IS NOW ON OUR WEBSITE.

PRICES AND AVAILABILITYARE SUBJECT TO CHANGE WITHOUT NOTICE.

CLEANING RODS

BORE TECH .17-.22 -.6 -.30 Calibers	$37.57
BORE TECH Jags for above	$4.85
BORE TECH .22-6mm 6mm-6.5 50" rod	$40.70
BORE TECH .22-6mm 270-.33 56" rod	$40.70
BORE TECH .338 cal 40"-44" $40.70; 52"-56"	$40.70
DEWEY 22/6mm 36" - 44"	$20.67
DEWEY .30 cal 36" - 44"	$20.67
DEWEY .35 and up 36" - 44"	$21.83
Other adapters & jags extra:	
Small adapter	$1.98
Large adapter	$1.98
Female threaded jag .22-6mm-7mm-.30 & up	$3.45
Male threaded jag .22-6mm-7mm-.30 & up	$3.45
Parker Hale female & male jags .22-.6mm-.7mm-30	$3.97
Many other DEWEY Products available	

CLEANING SOLVENTS

Butches Bore Shine 16 oz	$15.95
Kano Kroil 8 oz	$7.25
Sweet's 7.62	$9.49
Shooter's Choice 2 oz	$4.29
Shooter's Choice 4 oz	$6.42
Shooter's Choice 16 oz	$19.35
Hoppe's pint	$8.95
Hoppes quart	$13.95
Hoppes BR9 Copper solvent pint	$17.95
Bore Tech Bore Solvent 4 oz	$8.09
Bore Tech Bore Solvent 16 oz	$17.00
Bore Tech Benchrest Blend 4 oz	$11.33
Bore Tech Benchrest Blend 16 oz	$20.24
Bore Tech Moly Magic 4 oz	$12.14
Bore Tech Moly Magic 16 oz	$21.86
Bore Tech Copper Remover 4 oz	$8.09
Bore Tech Copper Remover 16 oz	$17.00
Iosso Bore Cleaner 1.5 oz tube	$6.00
Iosso Gun Oil 4 oz	$5.99
Iosso Gun Oil 32 oz	$16.95
J-B Cleaning Compound	$7.45
Tru-Kote Die Wax	$4.95
Krazy Kloth	$1.99

POWDER

VIHTAVUORI N130/N133/N135/N150/N160 2 POUND	Call
VIHTAVUORI N130/N133/N135/N150/N160 8 POUND	Call
H3221 POUND	$18.79
H3228 POUND	$134.95
H41981 POUND	$18.79
H41988 POUND	$134.95
H4831 SC 1 POUND	$18.79
H4831 SC 8 POUND	$134.95
H48951 POUND	$18.79
H48958 POUND	$134.95
BENCHMARK 1 POUND	$19.21
BENCHMARK 8 POUND	$134.95
VARGET 1 POUND	$18.79
VARGET 8 POUND	$134.95
ALLIANT, ACCURATE and IMR powders also available	Call

PRIMERS

FEDERAL 205 small rifle/1000	Call
FEDERAL 205M small rifle/1000	Call
FEDERAL 210 large rifle/1000	Call
FEDERAL 210M large rifle/1000	Call
FEDERAL 215M large mag rifle/1000	Call

BRASS

LAPUA .220 RUSSIAN/100	$68.00
LAPUA .243/100	$62.00
LAPUA 6MM BR/100	$59.00
LAPUA .308/100	$52.00
LAPUA 6.5 X 284/100	$88.00
LAPUA .338/100	$198.00
REMINGTON Bulk Brass most calibers	Call

GUNSMITHING

Standard Muzzle Brake Installed	$171.81
Accurize Package:	
Call or Visit Website For Details	$225.00
All Other Gunsmithing	Call

ALL POWDER AND PRIMERS SUBJECT TO UPS HAZ-MAT FEE OF $20.00.

ROBERT W. HART & SON, INC.
401 MONTGOMERY STREET
NESCOPECK, PA 18635
PH: 1.570.752.3655 FAX 1.570.752.1088
ORDER LINE 1.800.368.3656

VISA MasterCard DISCOVER

Understanding The Bullet's Flight..., Part I *Continued*

about the origin of the "wind axes" aligned with the bullet's velocity vector direction, instead of about the incoming direction of the apparent wind. The standard analytical formulation fits ***only*** indoor Spark range data, and it cannot accommodate real winds. [We intend helping to remedy that situation.] Also, note that the apparent wind velocity vector is normally going to be controlled predominantly by the much larger bullet velocity compared to the wind velocity in any reasonable case except, perhaps, for air-to-air or air-to-ground gunnery. The concept of apparent wind is an important key to understanding the flight of the bullet.

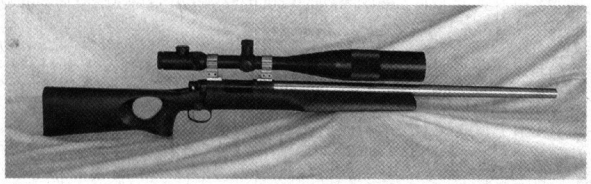
OVERTURNING MOMENT

In the standard formulation, as used at BRL, the overturning moment acting on the bullet at its CG is found in a way similar to how we just found the drag force. The moment (**M**, in pounds-feet) is the product of the potential dynamic force (**DYN**, in pounds) times the diameter of the bullet (**d**, in *feet*), times the Sine of the angle of attack **(a)**, times a dimensionless moment coefficient **CM(a)**. The overturning moment coefficient for each bullet varies primarily with Mach number, and secondarily with angle of attack **a**.

Neglecting the bullet's "spin effects" for now, a ***single force vector*** applied at the "center of pressure" on the axis of symmetry of the bullet can represent the entire ***distributed aerodynamic force*** exerted over the whole surface of the bullet at any point in space and time during the bullet's flight. In fact, the center of pressure (CP) is an artificially designated point on the bullet's axis of symmetry, normally located well forward of its center of mass, at which this *total aerodynamic force vector* would have to be applied to produce *both* the instantaneous *net force* and the instantaneous *overturning moment* acting on the bullet. To avoid possible confusion, we will use CG, for center of gravity, as an abbreviation for the center of mass of the bullet. A basic principle of the physics of rigid bodies is that an applied force such as the total aerodynamic force **F** through the bullet's center of pressure (located at a vector distance **R** along the axis of the bullet, forward from the bullet's center of mass) is equivalent to, and can be replaced by, the same force **F** acting through the bullet's center of mass plus a *force couple* (**F** and **–F**) in the common plane

Six Enterprises

Custom Benchrest/Varmint Rifles built using Lee Six stocks
Stolle, Hart, Bat, Nesika Bay, or Remington Actions
Shilen, Lilja, Hart, or Kreiger Barrels
We will also build using your choice of parts



We are a Stocking dealer of NightForce Scopes
Check our Web site for current prices

Visit our new web site
www.LeeSixInc.com

320-D Turtle Creek Court San Jose, Ca 95125
Phone 408 999-0201 Fax 408 999-0216
Info@LeeSixInc.com

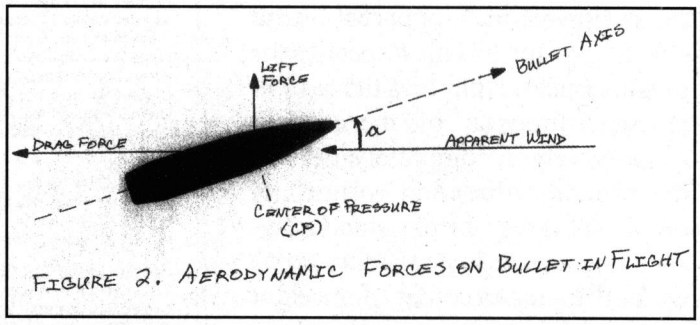


FIGURE 2. AERODYNAMIC FORCES ON BULLET IN FLIGHT

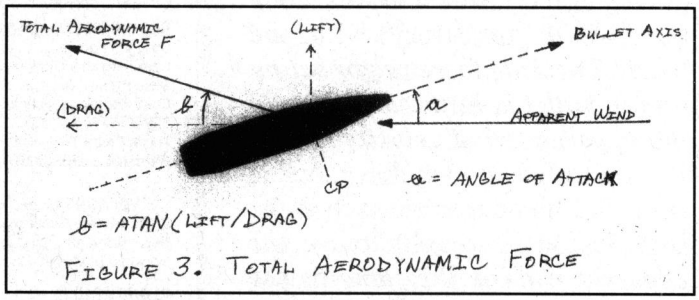


FIGURE 3. TOTAL AERODYNAMIC FORCE

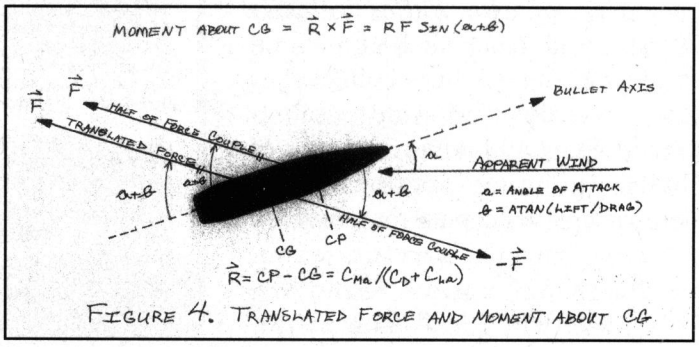


FIGURE 4. TRANSLATED FORCE AND MOMENT ABOUT CG

producing only a *moment* about the center of mass. The moment about the bullet's CG is defined to be **RxF, a vector cross product**. A moment is a torque vector, the rotational analogue of a force vector in an inertial space. The direction of the torque vector is the axis of the rotation about the CG and is perpendicular to the plane of **R** and **F**, and positive in the usual right-handed sense. The scalar size [indicated by enclosure in brackets] of this vector overturning moment is the magnitude (in pounds-feet) of the vector cross product, and is given by:

[M] = [Overturning Moment] = [RxF] = [R]*[F]*Sin(a+b)

where **R** = Vector distance displacement of the CP from the CG in feet

[R (in calibers)] = CM(a)/(CL(a) + CD), using BRL coefficients.

F = D + L = Total aerodynamic force vector in pounds, and

a+b is the angle between the directions of the two vectors, **R** and **F**, as shown in Figure 4.

The current total angle of attack is **a**, and **b** is the angle whose tangent is the current lift-to-drag ratio **L/D**. In the standard formulation, the tangent of the angle **b** can be found from **CL(a)*Sin(a)/CD**, where **CL(a)** is the dimensionless coefficient of lift, discussed below.

Figures 2, 3 and 4, respectively, show the drag force **D** and lift force **L**, acting separately on the bullet's center of pressure **(CP)**; then the total (vector summed) aerodynamic force **F**, acting at the CP; and finally the total force **F**, acting at the bullet's center of mass CG, plus the force couple producing only a moment about the CG, and no net translational force. All three of these diagrams are ***mechanically equivalent***. [It may help to see that Figure 4 is equivalent to Figure 3, if we envision adding into Figure 3, the two *offsetting* forces (**F** and **–F**) acting at the CG of the bullet.] We prefer to analyze the bullet's motions in terms of the forces and moments acting on the center of mass CG of the bullet where they are "de-coupled" from each other. Of course, the displaced total aerodynamic force **F** shown in Figure 4 can readily be

Continued on next page

Table 1. BRL Data on .308 Sierra 168gr International Bullet in ICAO Atmosphere

Range	yards	Muzzle	100	200	400	600	900	1000 Yards
Bullet Velocity, V	ft/sec	2600.0	2403.2	2214.9	1852.0	1524.4	1148.2	1069.6 ft/sec
Time of Flight, t	seconds	0.0000	0.1200	0.2501	0.5461	0.9033	1.5899	1.8613 seconds
Mach Number	(V/1116.45 ft/sec)	2.329	2.153	1.984	1.659	1.365	1.028	0.958
Cone Angle (a)	degrees	1.018	1.54	1.7	2	2.3	5	5 degrees
Spin Rate, p	cycles/second	2600	2558	2516	2428	2337	2192	2142 hertz
Forces and Moments:								
Del=Sin(Cone Angle, a)		0.0178	0.0269	0.0297	0.0349	0.0401	0.0872	0.0872
CD=CD(0)+Del^2*CD(2)		0.3326	0.3440	0.3584	0.3828	0.4236	0.4694	0.4320
CM(a)=CM(a0)+Del^2*CM(a2)		2.6286	2.7068	2.7761	2.9446	3.0629	3.1670	3.3873
Coef of Lift, CL(a)		2.75	2.65	2.58	2.36	2.11	1.46	1.31
Dynamic Force, DYN	pounds	4.16	3.55	3.02	2.11	1.43	0.81	0.70 pounds
R = CP-CG = CM(a)/(CD+CL(a))	calibers	0.853	0.904	0.945	1.074	1.209	1.641	1.944 calibers
Moment=(d/12)*DYN*Del*CM(a)	lbs-ft	0.004985	0.006634	0.006379	0.005565	0.00451	0.005746	0.005333 lbs-ft
Lift Force=DYN*CL*Del	pounds	0.2032	0.2530	0.2310	0.1738	0.1211	0.1032	0.0804 pounds
Drag Force=DYN*CD	pounds	1.3830	1.2223	1.0815	0.8076	0.6055	0.3807	0.3041 pounds
Angle b=ARCTAN(L/D)	degrees	8.36	11.70	12.06	12.14	11.31	15.17	14.80 degrees
F = SQRT(D*D+L*L)	pounds	1.3978	1.2482	1.1059	0.8261	0.6175	0.3944	0.3145 Pounds
Coning Motion Data:								
Fast Mode Oscillation Rate	(cycles/sec)	286.4	295.6	297.1	297.5	295.5	285.9	280.2 cycles/sec
Slow Mode Coning Rate (CR)	(cycles/sec)	62.51	53.32	46.23	34.25	24.31	14.86	14.07 cycles/sec
Ratio of Rates	(Fast/Slow)	4.58	5.54	6.43	8.69	12.15	19.24	19.92
RL=ky^2*(CL/CM)*Ratio*Del	inches	0.021	0.036	0.044	0.060	0.084	0.192	0.167 inches
Apex Dist=RL/(d*Del)	calibers	3.87	4.38	4.82	5.62	6.76	7.16	6.22 calibers
Cross-Check Values:								
Torque=(d/12)*R*F*Sin(a+b)	lbs-ft	0.004984	0.006632	0.006377	0.005563	0.004507	0.005729	0.005318 lbs-ft
RS=(3*g/(Pi^2*w))*L/CR^2	inches	0.021	0.036	0.044	0.060	0.083	0.190	0.165 inches
Gyro Prec Rate=Mom/(2Pi*p*Ix)	hertz	0.91	1.23	1.21	1.09	0.92	1.25	1.18 hertz
Gyro Nutation Rate=(Ix/Iy)p/2Pi	hertz	348.96	343.33	337.69	325.86	313.65	294.24	287.54 hertz

Understanding The Bullet's Flight..., Part I

Continued

resolved once again into its lift **L** and drag **D** components, only this time acting upon the bullet's center of mass. The effects of this translated lift force **L** acting on the CG of the bullet will be extensively discussed in the remainder of this article. The values for the BRL-formulated overturning moment are shown for selected ranges in Table 1, along with my crosscheck values calculated as above, but labeled as "torque" values, for distinction. The two sets of moments agree to the fourth significant figure out to long range.

LIFT FORCE

In the standard analytical formulation, the lift force **L** acting perpendicular to the drag force, and at the CG of the bullet in flight, is found in a way analogous to how the other forces and moments on the bullet are evaluated. The lift force (in pounds) is the product of the potential dynamic force (**DYN**, in pounds) times the Sine of the angle of attack **a**, times a dimensionless coefficient of lift **CL(a)**. The coefficient of lift for each bullet varies with the Mach number of the bullet in flight (and *not* with the angle of attack in the basic analysis).

If the single, total aerodynamic force vector **F** shown in Figure 3 is perfectly aligned with the bullet's *apparent wind direction*, a "purely ballistic drag" will be produced. Otherwise, the difference between the downwind *ballistic drag force* component and the *total aerodynamic force* is a rectangular force component ***taken to be perpendicular to the drag force (and, thus, perpendicular to the apparent wind direction as well)***. This aerodynamic force component is termed ***lift*** regardless of the radial direction (roll angle) at which the side-force is acting to pull the bullet away from, or toward, its 3-DOF ballistic trajectory. For rotationally symmetric projectiles, such as our example bullet, the "roll orientation" of the lift force vector in the plane perpendicular to the drag vector *is completely determined* by the roll orientation of the bullet's ***yaw angle***, or "total angle of attack." In my nomenclature, the term "ballistic," as in "purely ballistic drag," implies *zero lift* when used it in this context. More generally, a "ballistic trajectory" is that of an *un-guided and usually un-powered* projectile, as in the absence of any intelligent control over the size and direction of the *lift vector* of the projectile, or over any available *thrust vector*, either or both of which might otherwise be used to steer the projectile toward a particular target, for example. The magnitude of the side-force vector called "lift" is inherently positive, without regard to its orientation with respect to the direction of the local gravity gradient.

The ***magnitudes*** of both the lift and drag forces ***certainly do depend upon the total angle of attack (or yaw)*** of the bullet in flight. If the bullet flies exactly point-forward into the local air mass, it produces its smallest possible drag force and no lift at all. Any other bullet attitude in flight is characterized by a single yaw angle (**a** as shown in Figure 2) measured from the direction of the *approaching apparent wind* to the direction of the *bullet's axis of symmetry* (nominally its spin axis). This identification of the "total angle of attack" of the flying bullet with a "yaw angle," is used in studying the exterior ballistics of

Stiller's Precision Firearms, LLC
Custom Rifles and Receivers
For the Best Quality at an Affordable Price
Specialists at long range and competition
Complete Rifles starting at $2200
•Predator series receivers retail $750
•Perfect for your big game or varmint project
•Long/Short/XP and all bolt faces available
•Repeaters or single shot
•Viper/Diamondback receivers $900 up
•Competition benchrest actions
•Also great for varminting or long range
www.viperactions.com
972 429 5000

rotationally symmetric, spin-stabilized projectiles (e.g., bullets in free flight), and differs from the airframe-oriented definitions of the Eulerian attitude angles; "pitch," "roll" and "yaw" used in aircraft flight control. At least for reasonably small yaw angles **(a)**, the size of the bullet's ***aerodynamic lift force is modeled as being linearly proportional to the sine of the yaw angle a*** producing it. And, both the bullet's coefficient of drag **CD** and its overturning moment coefficient **CM(a)** are modeled as having small *additive correction terms* that each vary with the ***square of Sin(a)***. In this way, the bullet's drag force and moment coefficients are corrected to increase and decrease, respectively, by small amounts with increasing yaw angle **a**. The lift force, like the drag force and the overturning moment, is not directly dependent upon the spin of the bullet. The lift forces on our example bullet are shown in Table 1 for selected ranges, as they would occur during a typical flight.

OTHER FORCES AND MOMENTS

The Spin (or Roll) Damping Moment, Pitch Damping Moment, Magnus Force, Magnus Moment, etc., are not explained here because an understanding of them is not really essential to this level of discussion.

EPICYCLIC SWERVE

We can study bullet motion by firing through "yaw cards" at a shooting range, by using spark photography of free-flying bullets inside a fully instrumented test range, by tracking the projectiles on an outdoor firing range using a modern Doppler radar system, and by utilizing sophisticated six-degree-of-freedom (6-DOF) exterior ballistics computer modeling programs using coefficients derived from the instrumented firing ranges or from measurements made with a model of the bullet in a supersonic wind tunnel. Each of these approaches produces evidence showing that the spin axes of real rifle bullets actually trace out an *epicyclic motion*, rotating clockwise as seen from behind, when the bullets are fired from right-hand twist barrels. Here we are discussing modern, high-velocity, low-drag, jacketed target rifle bullets in particular, but one could apply these concepts reasonably well to any spin-stabilized, rotationally symmetric projectiles of more than about two calibers in length.

The term "epicyclic" refers to the path of a point somewhere along a radial of one circle rolling in a plane along the outside of a second fixed circle without slipping. In the terminology of BRL, the second, relatively fixed circle is called the "slow-mode" motion, and its radius is called the "slow-mode arm." As shown in Figure 5, the center of the "fast-mode" circle is located at the rotating end of the slow-mode arm. Its "fast-mode arm," usually rotating several times faster than the rate of the slow-mode arm, traces the

Continued on next page

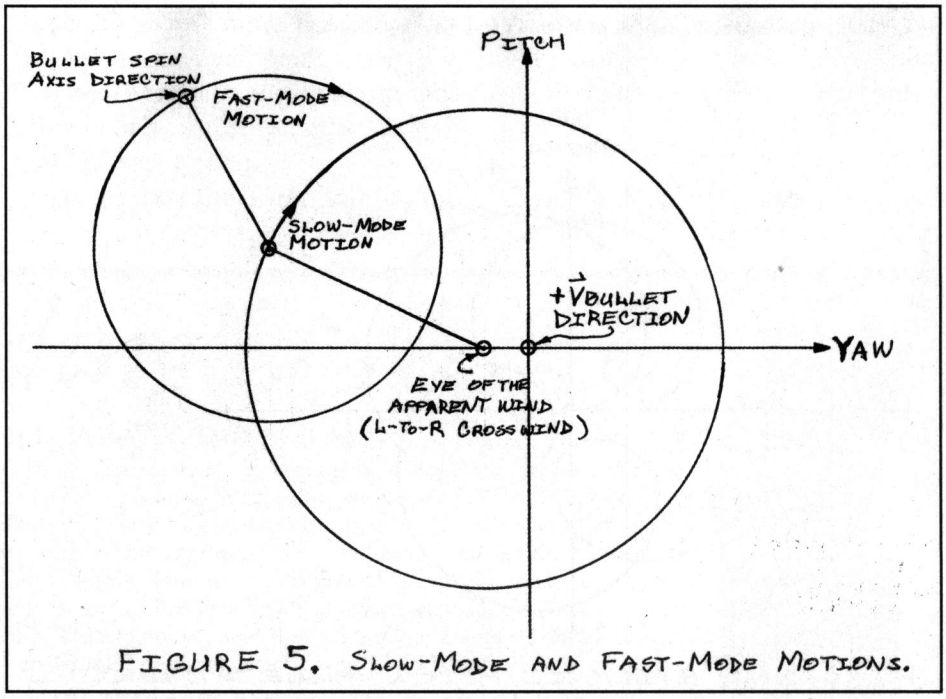


FIGURE 5. SLOW-MODE AND FAST-MODE MOTIONS.

Understanding The Bullet's Flight..., Part I

Continued

"epicyclic path" of the pointing direction of the bullet's spin axis (as shown in Figure 6). In this case the direction of the spin axis initially follows an epicyclic path in pitch and yaw angles (reverting to airframe-based terminology for the moment), that is centered on the bore pointing direction of the rifle barrel's muzzle at the very beginning of the bullet's flight. As the bullet moves down range, the direction indicated by the *origin of the pitch and yaw* axes always points in the direction of the *bullet's velocity vector* (i.e., tangent to its mean 3-DOF trajectory). We term these angular pitch and yaw coordinate axes as the ***wind axes*** for short. This coordinate system definition is convenient for conceptualizing the complex responses of the spinning bullet to the aerodynamic forces and moments affecting its motion as a free-flying body.

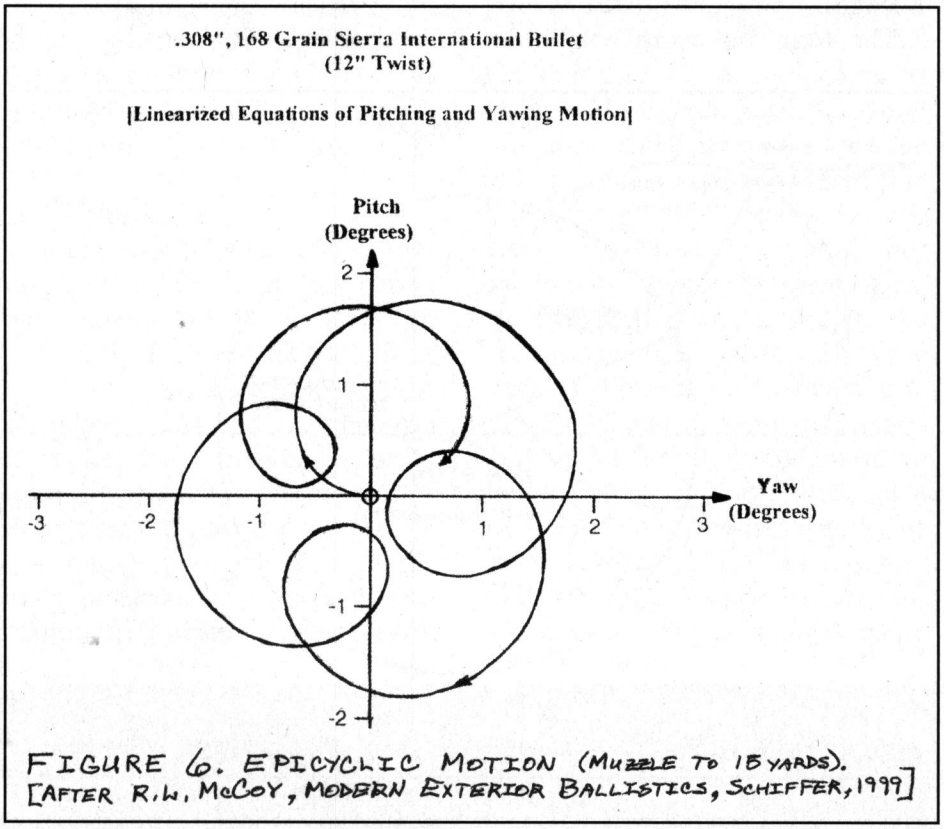


FIGURE 6. EPICYCLIC MOTION (MUZZLE TO 15 YARDS).
[AFTER R.L. McCOY, MODERN EXTERIOR BALLISTICS, SCHIFFER, 1999]

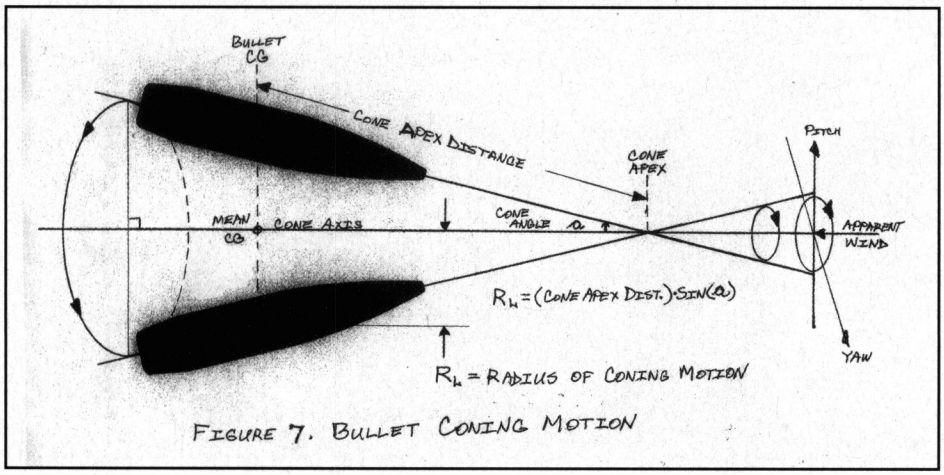


FIGURE 7. BULLET CONING MOTION

In the epicyclic pattern of movement of the bullet's pointing direction immediately after launch, the two clockwise motions (shown as slow-mode and fast-mode motions in Figure 5) are essentially independent of each other, once set into motion, and are damped at differing rates. While the bullet's spin axis does trace an epicyclic pattern as shown in Figure 6, unfortunately the BRL terminology, "epicyclic swerve," could misleadingly imply that some physical object, such as the bullet's CG, is following an epicyclic path, which it cannot do. Only the *pointing direction* of the bullet's spin axis can follow such an intricate path in angular pitch and roll coordinates. I prefer simply to describe the motion of the bullet itself as "coning," which accurately names both the motion of the bullet's CG and the stable, slow-mode movement of the pointing direction of the bullet's spin axis, as shown in Figure 7, Bullet Coning Motion.

BRL DATA ON BULLET EPICYCLIC MOTIONS

Without going into all the gory details, let me just state that the auxiliary parameters and the fast and slow rates of the bullet's epicyclic motion, given in Table 1, Coning Motion, were calculated from BRL data in accordance with the standard formulation. However, I took the liberty of converting the rates of angular motions from the canonical units so beloved by ballisticians, radians per caliber of travel, into actual time rates in cycles per second, or hertz.

Notice that the bullet's time rate of fast-mode "oscillation" is *practically constant* at about 290 hertz throughout the flight in BRL's formulation [See Table 1]. Per Dr. Mann, this "oscillation rate" is typically between three and seven times (4.6 times here) faster

than the bullet's initial (highest) "gyration rate," or coning rate, just after launch. Oscillation is a fast-mode nodding or bobbling motion of the bullet's spin axis that resembles gyroscopic nutation and is normally due to launch disturbances caused by:

1) A worn, distorted or dinged muzzle crown,
2) A damaged or un-square bullet base,
3) Imperfect bullet obturation,
4) A crosswind at the muzzle,
5) In-bore yaw, or by
6) A static or dynamic imbalance of the bullet itself.

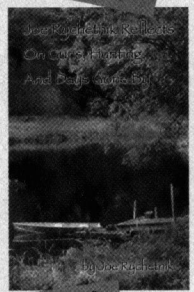
The initial angular size of the bullet's slow-mode "coning motion" (i.e., its cone angle **a**) begins right after launch with *whatever size oscillation motion the bullet might have been given initially*. The fast-mode oscillation amplitude subsequently damps down to an imperceptible level fairly rapidly (with this bullet, as with probably all match bullets) within the first few thousands of calibers of forward travel (i.e., within the first couple of slow-mode coning cycles). This damping out of the fast-mode oscillation of the bullet is probably what some benchrest competitors refer to as the bullets "going to sleep." The first oscillation and coning cycles start *180 degrees out of phase* with each other so that they sum to *zero* at the instant of bullet launch from the muzzle. Thereafter, the *first maximum yaw angle* occurs at just over halfway through the initial fast-mode cycle, and the axis of the bullet returns nearly to its launch direction at just more than the first full fast-mode cycle (and somewhat less nearly into its initial alignment after each subsequently more-damped fast cycle).

As the fast-mode motion damps out, it seems that about half of its initial oscillation amplitude adds into the slow-mode cone angle. With our example bullet here, as is probably typical of any modern bullet, the cone angle at 50 yards downrange is approximately 150 percent of its initial value, seemingly due to a contribution from the (originally equal sized) angular amplitude of the oscillation motion. As the fast-mode motion damps out, the oscillating motion of the bullet's axis seems to collapse *generally outward* toward the outer (larger radius) edges of the combined coning and oscillating motions. Then, after the oscillating motion has damped out, the cone angle at 50 yards seems to have stabilized at an average value about halfway between the initial

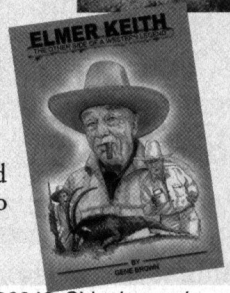
Continued on next page

Easy Reading...

The Border Wars of the Upper Ohio Valley (1769-1794), by William Hintzen. The opening of the Eastern Frontier was a 25 year no-quarter-given-or-asked period of warfare between the settlers and the Eastern Indian tribes. The epicenter of the fighting was to be in the vicinity of Fort Pitt (now Pittsburgh) and Fort Henry (now Wheeling, West Virginia), on the East bank of the Ohio River. "In a time and place where uncommon heroism and courage were common place..." moved the likes of Daniel Boone... the magnificent Zane family... Simon Kenton... Lewis Wetzel (*Death Wind*, as the Indians knew him)... The 1777 siege of Fort Henry... The Girty brothers... Sam McColloch... Betty Zane's dash for gunpowder... The remarkable Wetzel family... Sam Brady... George Rogers Clark... and Mad Anthony Wayne's final victory at Fallen Timbers. 390 pages, softcover, **$24.95**.



Joe Rychetnik Reflects On Guns, Hunting and Days Gone By.
Joe Rychetnik lived an adventurous life, ranging from his days with the Alaskan State Police right after that vast and largely unsettled land became a state in 1959... then the covering of Alaska as a reporter-photographer-correspondent for Time-Life News Service and United Press International (where he was a regular customer of many of the legendary bush pilots of Alaska)... as a Marine he survived the battle of Okinawa, and then the Korean War. But it was as a raconteur and a matchless teller of tales that Joe Rychetnik regaled the readers of *Precision Shooting* magazine for well over a decade. His book features thirty of his very best yarns, spread over 275 pages. Softcover, **$17.95**.



Elmer Keith: The Other Side of a Western Legend, by Gene Brown.
The Author is probably today's foremost authority on the ten firearms books that Elmer Keith authored during his lifetime. In addition he was a personal friend of Keith, and a frequent and welcome visitor to his Salmon, Idaho home. An interesting discourse on the man, his books, and of course, his guns. 168 pages. Softcover **$19.95**.

ORDER NOW: At prices shown above. **Order from:** Precision Shooting, 222 McKee Street, Manchester, CT 06040. Shipping and handling in U.S. is $3.50 for first book, $5.00 for multiple books. Foreign orders (including Canada) will be shipped Economy Mail unless Air is requested; both will be charged actual shipping costs plus $1.00 handling. Visa or MasterCard orders accepted without surcharge at our CT office (860) 645-8776 phone; (860) 643-8215 fax. CT residents add 6% sales tax; NY residents add 4% sales tax.

Understanding The Bullet's Flight..., Part I *Continued*

cone angle and the bullet's first maximum yaw angle, which was *almost twice* its initial coning angle.

THE EXCESSIVE LIFT PROBLEM

Recalling the example from our December 2007 *Precision Shooting* article, we launched a similar bullet with no in-bore yaw or tip-off rate, but into a uniform, horizontal, left-to-right 10 MPH crosswind. The resulting 20 MOA *angle of attack* of our spin-stabilized bullet encountering this 10 MPH crosswind at a muzzle velocity of 2600 FPS will generate a "cross-track" supersonic *lift* force in a rightward direction, and consequently, will produce a *greater* rightward wind drift effect. This rightward aerodynamic lift force is *over and above* the calculated 6.40 thousandths of a pound rightward component of the relatively large 1.135-pound average drag force over 200 yards. Earlier, we had calculated the potential aerodynamic drag force (**DYN**) to be 4.09 pounds for our example 30 caliber bullet moving at its launch speed of 2600 FPS through the old US Army METRO standard atmosphere that we used in that article. At this speed of Mach 2.32, our example bullet type has been reported to have a *coefficient of lift* **CL(a)** of **2.75**. If we multiply together this 4.09-pound potential dynamic force, times the coefficient of lift value of 2.75, and times the sine of the 20 MOA angle of attack (due to our 10 MPH crosswind), we find from this BRL formulation that the bullet must be generating an initial lift force of **0.0634 pounds** downwind, toward the right, starting as soon as the bullet clears the muzzle blast cloud. ***But, wait a minute!*** As small as this aerodynamic lift force might seem, it will accelerate our 168 grain bullet at 2.64 times the acceleration of gravity (or 2.64 g's), and it is **an order of magnitude *(ten times)* larger** than the **0.00640-pound** cross-track component of the drag force, and at least ***two*** orders of magnitude (a hundred times) larger than the assumedly negligible force that one would have expected. As we showed in the December 2007 article, the 6.4 thousandths of a pound cross-track component of the bullet's drag force is **sufficient** to account for the example bullet's **observed wind drift** over the first 200 yards of its flight.

While this presentation of the excessive lift problem is couched in terms of wind drift, any flight disturbance that causes the bullet to yaw, or to fly with a non-zero angle of attack, will cause the bullet to suffer this lift problem. We will explain in Part II of this article why this serious "excessive lift problem" does ***not*** cause us to experience vastly greater wind sensitivities during our outdoor matches. But we cannot do so within the bounds of the "standard formulation." Repeating for emphasis, before everyone starts blaming me for any poorer than expected groups fired in their last light-wind "trigger pulling contest," I am ***not*** saying that this hypersensitivity to crosswinds ever actually occurs, just that it would be *predicted* in the standard analytical formulation. One might suppose that this situation has persisted for so long because, as mentioned earlier, the standard analytical formulation has ***never been expected to handle real ambient winds***.

S. S. Wheeled Shooting Stool

THE FINAL SOLUTION TO MOVING YOUR EQUIPMENT ON THE RANGE.

TESTED AND PROVEN AT CAMP PERRY.

Schneller Manufacturing Inc.
727-549-2100
Order by phone or at
www.schnellermanufacturing.com

Knight's Bullets

Benchrest quality Bullets that make a difference
Made with only the BEST components using Carbide Dies

Knight Bullets are available in:

- 22 cal.
- 6mm
  (7, 7 3/4, 8, 9, ogives, boattail)
- 30 cal.

Orders may be placed by contacting Brady Knight at:
Brady@Knightsbullets.com – Telephone (334) 227-4567
P.O. Box 452, Fort Deposit, AL 36032

The Last Post

Part 139

FINAL RESTING PLACES OF FAMOUS RIFLEMEN

SACAJAWEA

Western Legend, Woman of Controversy

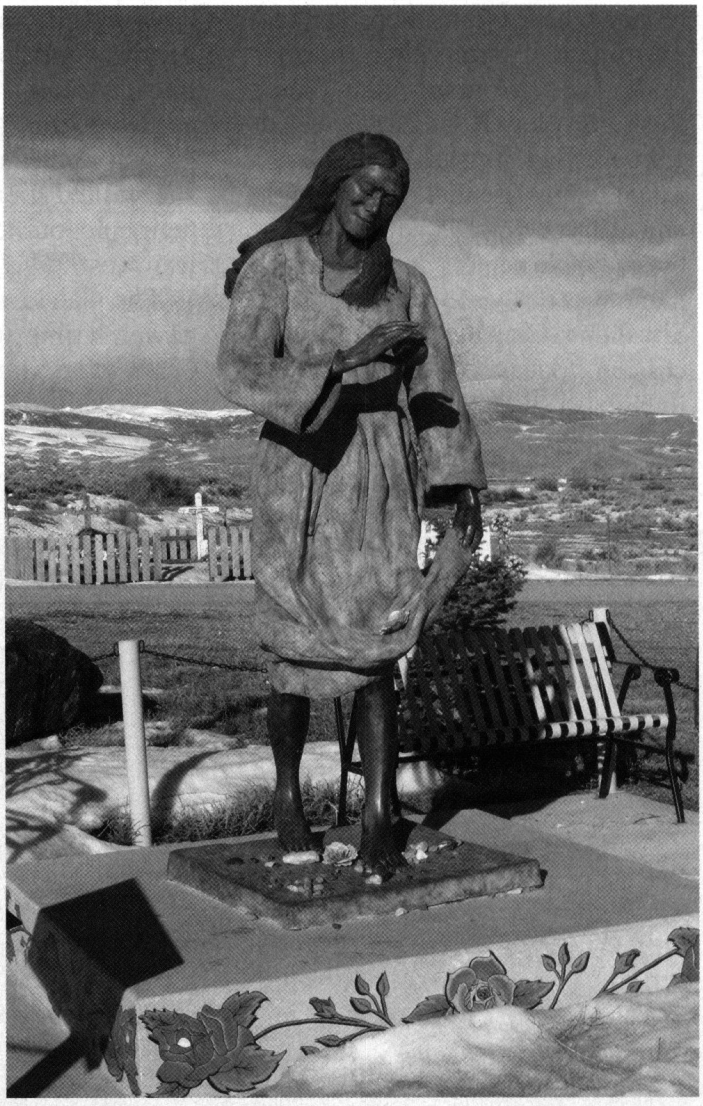
BY MARCIA BOOTH MURDOCK

The lore of western exploration would not be complete without mention of Sacajawea, the young Lemhi Shoshone woman who helped the Lewis and Clark expedition find its way to the Columbia River, and thus to the Pacific Ocean. Living only a few miles from the Sacajawea Cemetery as I do, when I started to research this article I was already aware there was some dissent about the final resting place of the famous Shoshone woman. But as I have delved into the different interpretations of her life after the Lewis and Clark "Voyage of Discovery", I found the combat among historians has been vicious! I am reminded of the time when as a youngster, I climbed a hickory tree in the dark of night, and upon reaching a crotch in the tree where there was a cavity, I suddenly became aware of the angry humming buzz of a bee's nest right under my nose. Yikes, what have I gotten myself into?

Interpretations of Sacajawea's role during the expedition, her actions, pronunciation and spelling of her name, her life after the expedition, and even her place and date of death vary widely, depending on what you read. Never have I seen so much discussion and so many definite opinions based on such a paucity of actual hard data. Following the threads of this remarkable woman's life leads in strange directions, and into continued controversy, even in the 21st century.

I'll settle my use of *Sacajawea* here by saying that I am aware that spellings and pronunciations vary (Sakakawea, Sacagawea, and other variations), depending on historian, interpreter, and other influences.

Continued on next page



Sacajawea's statue. An artist's rendition of her wading into the Pacific, and picking up a sand dollar. Note the collection of offerings at her feet, and the flower in the fold of her dress.

The Last Post – Sacajawea

Continued

I have chosen to use the spelling from the cemetery in Wyoming where her memorial stone stands. How can anyone tell how she would have spelled her name when she was not literate? Neither was there a written language for any of the tongues spoken by the native American tribes involved in her life. Most of the names used by native Americans back then were spelled phonetically by semi-literate whites who encountered them.

As far as the proper translation of her name, again there are two prominent versions that approximate Bird Woman, and Canoe Pusher/Puller (Boat Launcher). It is interesting how adamant the different camps are that they are right and everyone else is wrong. Part of the squabble centers on whether the name was derived from Hidatsa or Shoshone. Considering all the discussion, "Sacajawea" (Bird Woman in Hidatsa) would appear to be the name given to her by her Hidatsa captors. Canoe Pusher (which *could* have been a translation from a Shoshone word) would hardly have been the original name for a young girl who grew up in mountainous country without navigable waters. The pronunciation of the Shoshone word is not close to Sa-ca-ga-wea, either. Sacajawea may not have been the first name by which she was known, nor was it apparently the last name she used. It was common for members of many tribes of that period to change their names fairly frequently, and throughout their lifetimes. A single person might have several names in succession, all coming about due to certain significant events in their lives. More on this point later. At any rate, this young woman was known as Sacajawea by the time she joined Lewis and Clark on their epic journey across the American west.

The standard versions of Sacagawea's time with the Lewis and Clark expedition have her joining the expedition in 1805, as a 16-year-old new mother, and toting her newborn son Jean Baptiste Charbonneau on her back as she trekked across the great American plains and then the Rocky Mountains, and from there to the Pacific Ocean. Accounts of her exact status as Toussaint Charbonneau's wife vary somewhat, but when you track his own history back, it is probable that he did actually marry her in accordance with local custom, after acquiring her as a slave. He followed this pattern with several very young Indian girls during his lifetime. Charbonneau is generally painted as an unsavory man who probably ended up beyond the edges of civilization for good reason.

Sacajawea had come to the Hidatsa-Mandan village on the Missouri River, where Lewis and Clark camped that first winter, as a captive – spoils of war. A raiding party of Hidatsa had attacked her Shoshone encampment in Montana, killed several members of her band, and seized her and a few others, including another girl who was likely her sister, and who was probably called Otter Woman. Sacajawea had been captured at an age between 10 and 12, and had been with the Hidatsa for about four years when Charbonneau acquired her and the other Shoshone girl, both of whom he took to wife. Her age was recorded as an estimate in the Journals. Although the Shoshone kept a rigorous oral history, they had no written records. At the time, the event of her birth would have been unremarkable, and not incorporated into the oral history. She was somewhere between 15 and 17 when she delivered her first child. There is no record that indicates why Charbonneau chose her as his co-interpreter on the trip rather than the other Shoshone girl. It is clear, however, that Captains Lewis and Clark were convinced that having an in-

The three stones, Sacajawea's flanked by those for her two sons. Tradition says she is really buried up in the Wind River Mountains that can be seen snow-cloaked in the background.

terpreter who spoke Shoshone would be valuable, so they agreed to take her along. They actually hired only Charbonneau as the interpreter; Sacajawea was a bonus.

After leaving what is now North Dakota at the start of spring 1805, the "Corps of Discovery" continued their travel by water, up the Missouri River to its source waters in Montana. Eventually they were forced to abandon the waterways, and climb the Rocky Mountains on aboriginal trails, in their search for a connection to the great Columbia River. Early incidents along the way helped establish Sacajawea's value to the Corps. At one point Charbonneau, who was not a waterman, was at the helm of one of the boats, and through inexperience and lack of aptitude, nearly capsized it when the squally wind hit his sail. He has been castigated over time for his bone-headedness during that incident, but as described, his exact maneuver was typical of a new sailor's response in those conditions – his instinctive reaction was precisely wrong. While his other companions fought to right the craft, Sacajawea calmly collected valuable articles that were floating away. Her quick actions that day won her high praise in the expedition journals. Her knowledge of edible and medicinal plants, and their procurement, proved invaluable in extending and expanding the expedition's dwindling supplies and provisions. She also helped keep the men clothed in skin clothing as their garb was worn out and needed replacement.

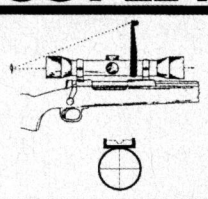
It was in the area of the Three Forks of the Missouri where Sacajawea first proved her worth as guide and interpreter for the expedition. She started to recognize landmarks and locations in the land of her childhood, and made the leaders of the Corps understand they were near her people, the Shoshone. This was important news because the expedition urgently needed to acquire horses for the trek over the Continental Divide. Her information helped direct the Captains in their search for the Shoshone. Ultimately Lewis met the band of Shoshone lead by Sacajawea's brother Chief Cameahwait, and she was reunited with her tribe for a time. The reunion with friends, and especially her brother, was very emotional as described in the Journals. It was also a significant stroke of luck for the expedition, as it undoubtedly disposed Cameahwait to greater cooperation with the whites than might have otherwise occurred. An added benefit from her traveling with the Corps was that the presence of a woman with a child in their company signaled that the Corps was not a war party. This distinction, more than once, saved them from being attacked by local natives.

It was during her reunion with relatives that Sacajawea adopted her dead sister's son, Bazil, then about 5 years old. There is little discussion of how this occurred, but evidently, a sister had been killed, possibly in a recent raid by Blackfeet Indians. It is not clear when she took over the care of the boy, but it must have been at a later date. He apparently did not accompany the expedition to the Pacific. Such adoption was common in the western tribal cultures. Bazil is

Continued on next page

Continued on next page

SCOPLEVEL®



If SHOOTERS would take 5 MINUTES and look at our website they would easily be able to perfectly align their rifle scopes and make long range shots with a predictability and confidence that would make them smile.

It makes us smile!!!

www.scoplevel.com

Our Reputation Precedes Us!

HART RIFLE BARRELS 280-REM

HART
Rifle Barrels, Inc.

Custom Target and Sporting Rifles for over 50 Years

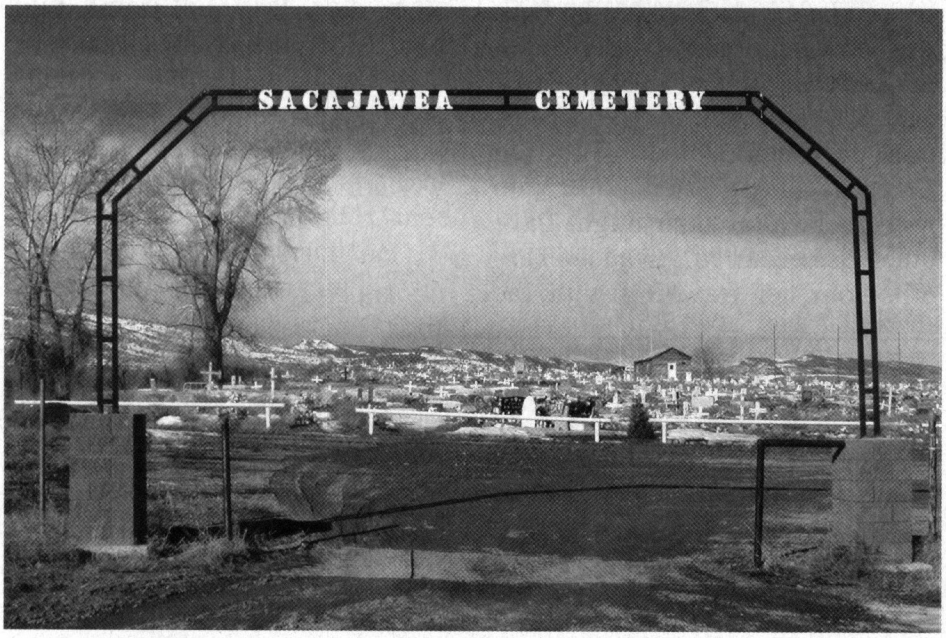
To learn more visit our website at www.hartbarrels.com
e-mail us at hartriflebarrels@sbcglobal.net or call 315-677-9841 for our latest catalog

The Last Post – Sacajawea

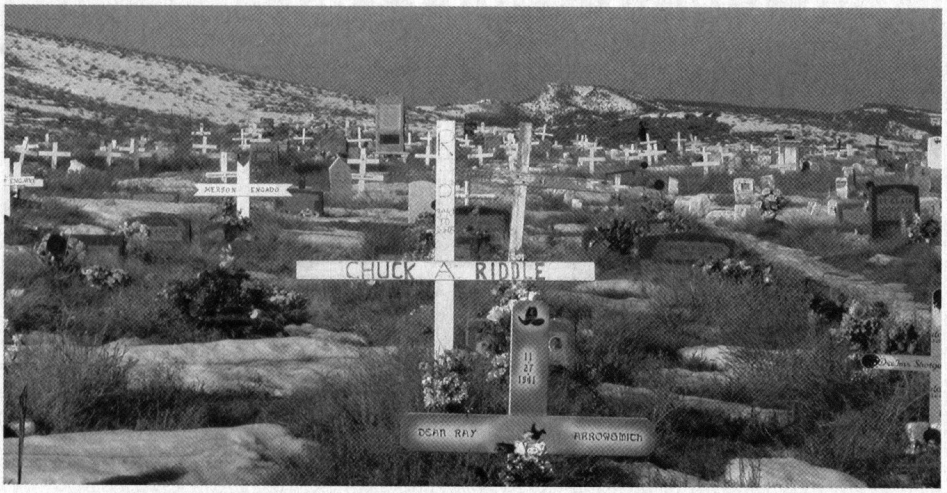
Continued

little mentioned in historic literature until years later, first in the Dakotas, then in particular toward the end of his adoptive mother's life.

The Corps moved on, after spending time with the Shoshone, and trading for enough horses to carry them to the navigable portion of the Columbia River. The trip across the mountains was grueling, and the fall weather might have been disastrous had they not finally come upon the Nez Perce tribe, who proved friendly and fed them. This did keep them alive, but the new diet proved hard on their gastrointestinal systems, and it was some time before they were without distress. (This may have been due to the camas root that was supplied. Some native plant foods can contain chemical constituents with strong medicinal character. Correct preparation is sometimes critical to edibility of native plants, and sometimes it takes awhile to develop tolerance to them. Relatives of the edible camas species are deadly poisonous.) In addition to keeping the Corps from starving, the Nez Perce provided a map of the local rivers that ran to the Pacific.



This simple archway admits visitors to the humble cemetery named after the legendary Lemhi Shoshone woman, Sacajawea.



A well worn path leads through the crowded graves to Sacajawea's memorial. Note the numerous simple wooden crosses, most hand painted.

They finally reached the tidewater of the Columbia River estuary system in late November 1805, and built a fort in early December. During the many months she was out with them, Sacajawea became accepted as an equal member of the expedition, as was Captain Clark's slave, York. This was evidenced most convincingly when both of them got to vote on the location of their winter quarters once they reached Pacific tidewater. In 1805 such a thing was unheard of; a woman and a slave voting. Fort Clatsop was near completion at Christmastime, and there the party celebrated the holiday with a gift exchange. Among gifts received, Captain Clark noted in his Journal that Sacagawea presented him with two dozen ermine tails. Such a gift indicated a close friendship. These were prized by the Shoshone for ornamentation, and represented a gift of considerable value. They stayed at the fort for several months, awaiting the spring thaw that would allow their return east.

One significant event during their stay at the mouth of the Columbia was the trip to the Pacific shore that was mounted when the party heard of a beached whale there. Sacajawea invited herself along on that trip – one of very few things she apparently asked for – and was indulged by the Captains. Lewis commented

Continued on page 72

Precision Shooting Publications

ABBREVIATED INDEX. An index of major articles that have appeared in **PS** beginning with the January, 1990 issue. $8.00 (S&H $3.50 U.S.)

ACCURIZING THE FACTORY RIFLE, by M.L. McPherson. The improvement of the factory rifle (bolts, pumps, levers and single shots) is discussed over 335 pages and more than 400 photos. Softcover, $44.95

AIRGUN ODYSSEY, by Steve Hanson. The author of *A Varmint Hunter's Odyssey* returns with his sweeping review of today's airgun market, from field models to target models and hunting models. The pros & cons of the airgun calibers are discussed in depth. 8x11, 186 pages. Softcover, $28.95; Hardcover $33.95

BENCHREST SHOOTING PRIMER. Some 420 pages, with 182 separate articles solely on the subject of benchrest shooting, and reloading for benchrest. The best articles on the topic from *Precision Shooting's* pages between 1982-1996. Softcover, $24.95

BLACK MAGIC, The Ultra Accurate AR-15, by John Feamster. The definitive work (1998) on the AR-15's accuracy potential at short, medium & long ranges, by the popular **PS** columnist. Over 300 pages. Softcover, $24.95

THE BORDER WARS OF THE UPPER OHIO VALLEY (1769-1794), by noted historian William Hintzen. Chronicles the bloody 25 years that was the winning of the Eastern Frontier, centered at Fort Henry (today, Wheeling, WV). Daniel Boone, Lewis Wetzel, Simon Kenton, the Girty Brothers. 390 pages, Softcover, $24.95

THE COMPLETE GUIDE TO AR-15 ACCURACY by Derrick Martin & Barrett Tillman. 17 chapters on accurizing the AR-15, by the principal of Accuracy Speaks, an AR-15 accuracy specializing gunsmith shop. 278 pages. Softcover, $24.95

CUSTOM GUNMAKERS OF THE 20TH CENTURY by Michael Petrov. A 168 page hardcover work that touches on many of the great custom gunmakers of the first half of the 20th century. Among many others: A.O. Neidner, Griffin & Howe, Hoffman Arms Co., Alvin Linden, R.G. (Bob) Owen, Fred Adolph and R.F. Sedgley. $24.95

DESIGNING AND FORMING CUSTOM CARTRIDGES, by Ken Howell. The out-of-print 1995 dated classic work is back. 600 full size pages, 450 one half scale chamber drawings, and 100 pages of advanced handloading information for the enthusiast. Hardcover $59.95. Note: oversized book; S&H in US is $5.00 for first book, $6.50 for multiples.

ELMER KEITH: The Other Side of a Western Legend, by Gene Brown. **PS** persuaded Gene to update and expand his original work. Gene is unquestionably the leading authority on Keith's books. Softcover, $19.95

THE HIGHPOWER SHOOTING PRIMER. Contains 173 of the very best Highpower articles from the 1990-1999 years of *Precision Shooting.* 520 full size pages. The companion volume to *The Benchrest Shooting Primer.* $34.95. Note: oversized book; S&H in US is $5.00 for first book, $6.50 for multiples.

IRISH RIFLEMEN IN AMERICA, by Arthur Leech. A limited run of 1,000 copies of the story of the Irish Rifle Team, then the Champions of the world, and their journey to America for a historic match with the hitherto unknown and inexperienced American Rifle Team at Creedmore Range, NY. The original work, printed in 1875, authored by the Coach of the Irish Team, was also a 1,000 copy press run, and is just about unobtainable today on the old book market. This is an exact copy of the original, including the autograph of Major Leech. Hardcover, $39.95

JOE RYCHETNIK REFLECTS ON GUNS, HUNTING, AND DAYS GONE BY. 30 articles, some new, some old favorites, on the world of firearms, from everyone's favorite yarn teller. 275 pages. Softcover, $17.95

MILITARY & POLICE SNIPER, by Mike Lau.'98 work from the Texas Brigade Armory principal. What you need to know about practical field shooting, plus a review of the rifles, scopes & cartridges of today. Softcover, $35.00

PRECISION SHOOTING AT 1,000 YARDS. 13 chapters discuss how-to at the 1,000 yard marker for various accuracy disciplines. Highpower, benchrest, military sniping, live varmint shooting, F-Class, plus gunsmithing & handloading for the yardage. In-depth interviews with famous long range shooters. Softcover, $34.95

PS RELOADING GUIDE. Not a reloading manual, rather a 284 page guide to reloading for the various disciplines concerned with "extreme rifle accuracy." Chapters on Highpower (bolt gun), Highpower (gas gun), Benchrest, Magnums, Wildcats, Cast bullets, & Working up an Accuracy Load. Spiral bound, $22.95

PRECISION SHOOTING WITH THE M1 GARAND, by Roy Baumgardner. 20 chapters on accurizing everyone's favorite veteran. 142 pages, Softcover, $12.95

RIFLE ACCURACY FACTS, by Harold Vaughn. The sequel to the 1909 classic work *The Bullet's Flight,* by Dr. F.W. Mann. Almost 300 pages from a leading researcher of today. Softcover, $34.95

THE SEARCH FOR CORPORAL DOW, by Gene and Linda Solyntjes. A full-size book of 212 pages, 48 black and white photos and 16 full color photos. Comprehensive instructions on how to research any member of the US Armed Forces back to the French and Indian War. Similar in-depth instructions about researching just about any US-made firearms with an emphasis on martially-connected and historically-connected firearms. A CD is included for ease of linking to many of the suggested sources. Hardcover, and eminently suited for gift giving. $34.95

THE SHOOTER'S CORNER, by Don Lewis. A 480 page, hardcover book that covers all the basics of the usage of a wide spectrum of sporting firearms & related accessories, including handloading. The very best choice for the relatively new shooter. Hardcover, $27.95

A VARMINT HUNTERS ODYSSEY, by Steve Hanson. The definitive work on varmint hunting, from short to ultra long ranges. Covers rifles, scopes, accessories. State of the art to late 1999. 279 pages. Softcover, $37.95

Book Club Offerings

ARROWMAKER, by Roy Chandler. The superb historical novel of the first settler in the Endless Hills of colonial PA during the Indian Wars period. This is a 2nd edition. **Autographed.** $36.00

The BLACK RIFLE, by Roy Chandler. The 2nd in the Chandler historical novels series, this follows Arrowmaker, the 1st in the series and continues in the vein of Indian warfare on the Eastern frontier. **Autographed.** $36.00

COMPLETE ILLUSTRATED GUIDE TO PRECISION RIFLE BARREL FITTING, by John Hinnant. Third edition, August 2003. Full size book, softcover. 304 total pages. 146 AutoCAD illustrations. 104 additional pages, 49 new illustrations and 55 pages of new text (from the first edition.) **Autographed.** $35.00

DEATH FROM AFAR, VOL. IV AND V, by Chandler & Chandler. The final two books in the Chandler's landmark 5 volume review of US Marine sniping in the Vietnam & post-Vietnam eras. Each is in hardcover and is **autographed.** $54.95 each

THE HUNTER'S ALASKA by Roy Chandler. The author has hunted Alaska for half a century and thoroughly covers the big game of the "Great Land" as well as rifles, cartridges, sights and camping tips for maximizing the new hunter's results. The great bears, mountain goats, grizzly, Dall, moose, wolves, caribou, theyre all here. Full size book (8 1/2x11 over 300 pages and 190 photos. Press run of 2500 copies, numbered and **autographed by the author.** $54.95.

ONE SHOT BROTHERHOOD, by Chandler & Chandler. The state of the sniping art as of Fall, 2001, commingled with sniping history, personalities, & equipment commentary (both pro and con). Over 500 pages & over 400 photos. **Autographed.** $59.95. Note: oversized book, S&H in US is $5.00 for first book, $6.50 for multiples.

TO BE A MILITARY SNIPER by Greg Mast and Hans Halberstadt. A thoroughly interesting book throughout its 144 pages, with 120 color photos and 20 B&W photos, the **PS** editor considers it the most *interesting* reading of any of the many books currently available on the topic of sniping. You will have no trouble keeping focused on this book's contents. Softcover, full size, 8 1/4 x 10 5/8. $21.95.

SNIPER ONE, by Roy Chandler. Perhaps the 1st sniper novel to be written by an author who knew a sniper from a warthog. **Autographed by the author.** $39.95

WHITE FEATHER, by Chandler & Chandler. The long-awaited "2nd" book on Carlos Hathcock. Hardcover, $49.95

SNIPERCRAFT: The Art of Police Sniping by Derrick Bartlett. Authored by an 18 year veteran law enforcement officer, & an active duty SWAT/Sniper with Ft. Lauderdale Police Dept. 138 pages. Softcover, $5.00

THOSE DEVILS IN BAGGY PANTS, by Ross Carter. The enduring story of the 82nd Airborne's fight across North Africa & Europe, culminating in the Battle of the Bulge. Softcover, $10.00; Hardcover, $12.00

ORDER FROM: *Precision Shooting,* 222 McKee St., Manchester, CT 06040. S & H for orders in the U.S. is $3.50 for first book, $5.00 for multiple books (unless otherwise noted). Foreign orders (including Canada) will be charged actual shipping costs plus $1.00 handling. Call (860) 645-8776 phone; (860) 643-8215 fax. CT residents add 6 % sales tax. NY residents add 4% sales tax.

The Last Post – Sacajawea

Continued from page 70

that she told them "...she had traveled a long way with us to see the great waters, and that now that monstrous fish was also to be seen, she thought it very hard she could not be permitted to see either." She had traveled at least 1,500 miles in their company at that point. In her late years she still told of going to see a fish the size of a cabin. She also must have collected some seaside souvenirs for she apparently gave a sand dollar to Chief Washakie, the great Shoshone peacemaker, at some point. He used one as adornment for many years.

I am not rehashing all the events of the expedition, because there are far too many, and if the reader wishes, he or she may read the Journals, or one of hundreds of interpretations thereof. I can do no better in condensing their odyssey than others have already done. Suffice it to say that it took an iron constitution to endure the physical challenges and privations of the trip, especially the winter of lean provisions and extreme boredom that was spent at Fort Clatsop. Most of the members of the expedition had suffered various injuries, ailments and illnesses, including Sacajawea, who had been very ill at one point early in the trek. Amazingly, they only lost one member on that whole trip, and that early on. He was apparently a victim of appendicitis.

The Corps purchased food through trade with the local natives, and hunted deer and elk that were available nearby. Their staples were lean venison, dried fish, roots (perhaps camas), and occasionally dog. Another of Sacajawea's stories in her later years was of cooking dog for the soldiers of the Corps. One author (Ambrose) commented somewhat judgmentally that not Sacajawea, nor any of the men, ever went out to dig roots, but they were always purchased from the natives. As a botanist, that does not seem to me to have been a bad idea. This was a habitat new to Sacajawea, and trying to identify any type of root during winter, without flowers and leaves for positive identification, would have been risky. Especially when the close relatives of some edible ones like camas are nearly identical and are highly toxic. A mistaken identity could have killed them all.

The return trip over the Rockies was no less grueling than the western voyage in the fall. The Corps, anxious to be underway, started too early in the spring and found their way still blocked by slowly melting deep snow. After reclaiming their horses from the local natives, who had been paid to tend them for the winter, they tried to cross the mountains – against the advice of the locals. They were forced to turn back and wait. Finally, weeks later, after chafing delays, hired Nez Perce guides led them along an obscure trail across the Divide, and they re-entered the Missouri drainage at the end of

The stone for Jean Baptiste Charbonneau, the papoose of the Lewis and Clark expedition. He was known as Baptiste in his mature years. The stone is a memorial – he is buried in the Wind River Mountains to the west.

Manufacturers of Quality Custom Rifles

ULTRA LONG RANGE
Blue Printed Rifles
- Sporter / Varminter
- Bench Rest & 50 BMG's
- Tactical Speciality Rifles

OLD WORLD CLASSICS
- African Express Rifles
- Custom Fitted Double Guns & Barreled Actions

3,000 acre Shooting Facility
Tactical & Elephant Walk Type Schools Available

EVOLUTION USA

Evolution, USA
P.O. Box 154
White Bird, Idaho 83554
208-983-9208 • Fax: 208-983-0944
E-mail: evorifles@wildblue.net
www.evo-rifles.com

June 1806. They returned to a previous camp, Traveler's Rest, reclaimed cached supplies, and proceeded on a daring and somewhat foolhardy plan that split their force to explore different return routes through country occupied by hostile tribes.

Lewis' force went north to explore and evaluate the Blackfoot River and then the Marias River, deep in the territory of the hostile and dangerous Blackfeet tribe. Near the end of that trek, he met the Blackfeet and the small party narrowly avoided being massacred. His luck held, and by coincidence they met the party bringing the boats down the Missouri just as they hit the river. Despite his risky reconnaissance, he and his detachment all escaped unhurt, and with their scalps.

Clark, taking Sacajawea and Charbonneau along with the remaining members of the Corps, went south, retracing part of their original route, then east to intersect the Yellowstone River. Clark dropped off a few men on another detachment before continuing down the Yellowstone, reducing his own force. Along this route, Sacajawea again provided valuable service as a guide, directing him over Bozeman Pass to the headwaters of the Yellowstone. Clark's force had no hostile engagements, but lost horses to thievery. The forces rejoined into a single group on August 12, 1806 in present day North Dakota, just above the confluence of the Missouri and Little Missouri Rivers.

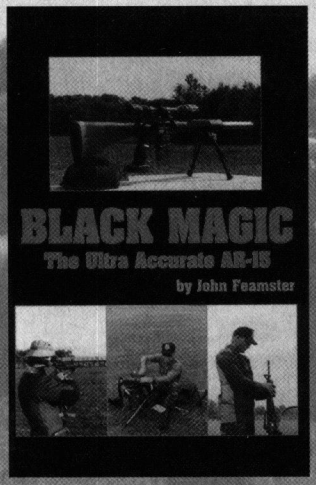
Two days after their reunion, the Corps returned to the Hidatsa-Mandan village where they had enlisted Sacagawea and Charbonneau. There they paid Charbonneau, left their interpreters behind, and pushed off downstream toward St. Louis. Sacajawea was not paid for her services – it appears that at least Clark felt badly about that. From that point forward, the records on Sacajawea's life become vague. Captain Clark obviously thought highly of Sacajawea, if not Charbonneau, having commented in his Journals, "Indeed she has borne with a patience truly admirable, the fatigues of so long a route, encumbered with an infant, who is even now, only 19 months old...In trouble she was full of resources, plucky and determined...Intelligent, cheerful, tireless, faithful, she inspired us all." He had also taken quite a fancy to Jean Baptiste, and had offered to raise and educate the boy once he could leave his mother.

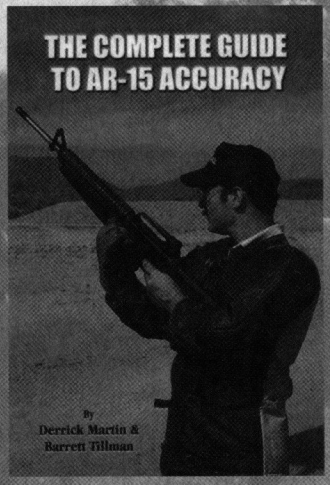
Continued on next page

AR-15 ACCURACY SPOKEN HERE!

TWO OF THE VERY BEST AR-15 ACCURACY BOOKS...

BLACK MAGIC The Ultra Accurate AR-15, by John Feamster. The original AR-15 accuracy book, now in its third printing. Covers the AR-15 waterfront: Competition AR-15s, Serious service rifles, Match and varmint rifles, AR-15 handloading, Accuracy testing, Experiments, tips and tweaking, 11 page appendix of suppliers. Over 300 pages. Softcover. $24.95





THE COMPLETE GUIDE TO AR-15 ACCURACY, by Derrick Martin and Barrett Tillman. Over 200 pages and over 250 photographs in what is probably the only AR-15 book authored by a full time accuracy gunsmith, who just happens to specialize in the AR-15. (Derrick Martin is the principal of the well known gunsmithing firm Accuracy Speaks, of Mesa, Arizona). Softcover $24.95

ORDER NOW at prices shown above. **Order from:** Precision Shooting, 222 McKee Street, Manchester, CT 06040. Shipping and handling in U.S. is $3.50 for first book, $5.00 for multiple books. Foreign orders (including Canada) will be shipped economy mail unless air is requested and will be charged actual shipping costs plus $1.00 handling. Visa or MasterCard orders accepted without surcharge at our CT office (860) 645-8776 phone; (860) 643-8215 fax. CT residents add 6% sales tax; NY residents add 4% sales tax.

The Last Post – Sacajawea

Continued

After the conclusion of the expedition, and once he got established there, Clark invited them to come to St. Louis, and eventually Charbonneau and Sacajawea made a trip to Clark's. Though they tried settling there, they did not remain long, and ultimately returned west. They left Jean Baptiste with Clark. Later, Clark adopted Jean Baptiste and his young sister (or half sister) Lizette. Records are silent on the life of Lizette (Lisette).

Jean Baptiste capitalized on the advantages provided by Clark. He gained the reputation as an excellent guide and trapper, was multilingual, speaking several languages in addition to his native Shoshone, and even went to Europe for several years as a guest of the German Prince, Paul of Wurttenberg. Upon his return to the United States, he spent his remaining days in the west. In his later years, he lived on the Wind River Reservation, and was known simply as Baptiste. His stone, which stands to the left of Sacajawea's, says "Dedicated in the Memory of Baptiste Charbonneau, Papoose of the Lewis and Clark Expedition – 1805-1806, Son of Sacajawea, Born February 11, 1805, Died on this Reservation 1885, Buried West in the Wind River Mountains." The current stone was placed in 1933.

The stone for Sacajawea's adopted son Bazil, who died only a couple years after his famous mother (1886). In the burial register, she is known simply as Bazil's Mother. Several of Bazil's children are buried nearby.

Her adopted son Bazil, avoided the limelight, and though he spent some time in the Dakotas, he eventually settled on the Wind River Reservation. Bazil's stone flanks his adoptive mother's on the right. His stone reads "Bazil, Son of Sacajawea, Aged 86 years, Died 1886. He was reburied here Jan. 12, 1925." The current stone was placed in 1932. Several of Bazil's children are buried adjacent to Sacajawea and her sons.

As for Sacagawea? Well, here is where much disagreement lies. There are two distinct stories with the camps of historians irrevocably divided. One version of Sacajawea's demise says she died at age 25 at Fort Manual Lisa in South Dakota. For some historians, the notes of John Luttig, a clerk at the fort, are irrefutable proof that Sacajawea died on December 20, 1812, following the birth of a daughter. He failed to name the woman who died, however, and only called her Charbonneau's wife.

There is some evidence that when Charbonneau went to St. Louis, he took both Sacajawea and Otter Woman, but returned with only Otter Woman. Although Luttig's record said "This evening the wife of Charbonneau, a Snake [Shoshone] squaw, died of a putrid fever. She was a good and the best woman in the fort, aged about 25 years..."; this woman could well have been Otter Woman. It is odd that while he used Charbonneau's name, he failed to name the wife. It stands to reason that if Otter Woman had been Sacajawea's sister, she might well have had a similar temperament to the one recorded for her famous sister. They may have been within a year of age, and perhaps could have been confused for each other, especially since both were "Charbonneau's wife". News of this death is probably what prompted Clark to make the notation "dead" next to Sacajawea's name in a notebook. Besides baby Lizette, there was also a boy, son of Charbonneau, called Toussaint who was in the mix. He was variously identified as perhaps Otter Woman's son, or the nicknamed Jean Baptiste (whose nickname on the expedition had been Pomp or Pompey). Ah, yes, the naming becomes confusing, spellings vary, and interpretations of scraps of written records seem too unequivocal for the sparse evidence. It is possible Charbonneau abandoned all the children upon the death of his wife. Luttig took the remaining children to St. Louis. He died not long after that, and they became wards of Clark.

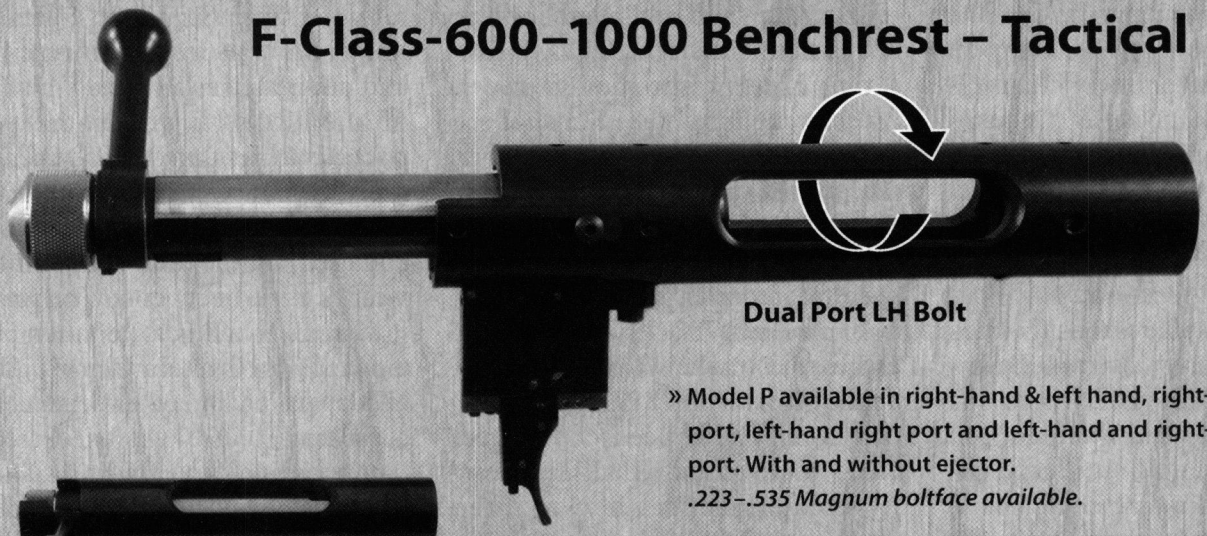
The other, better documented place of death and burial for Sacajawea is Fort Washakie, Wyoming on the present Wind River Reservation. The photos accompanying this article are from the Sacajawea Cemetery there. This version of Sacajawea's later life allows her to live to at least 95 years of age, produce additional offspring, and to eventually rejoin her Shoshone relatives back near her homeland in the mountains. This version is the one told by her known descendents, and carried in

Continued on page 76

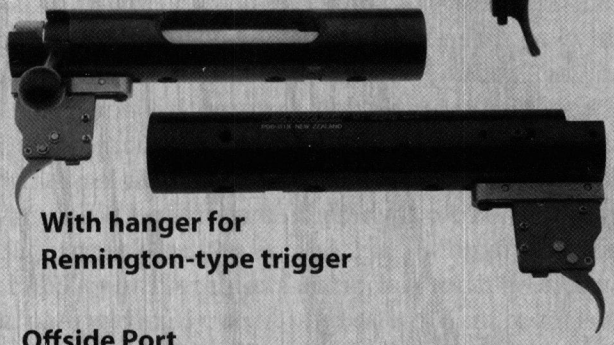
BARNARD

Not just Palma actions

F-Class-600–1000 Benchrest – Tactical



Dual Port LH Bolt



With hanger for
Remington-type trigger

Offside Port

With Optional V-Block

» Model P available in right-hand & left hand, right-hand left port, left-hand right port and left-hand and right-hand dual port. With and without ejector.
.223–.535 Magnum boltface available.

» Model PL action .580 to .620 boltface, 338 Lapua to 416 Rigby. Same specifications as the P but for large rim cartridges.

» The Action is a very rigid three lug bolt design 1.46" OD. For strength and smoothness of operation the receiver is double heat treated to 38 RC core and 68 RC surface

» All critical dimensions are machined after heat-treating, no blueprinting is required.

» Bolt to action clearance is .002" and it is fitted with a Sako type extractor.

» The striker is of a low drag design for easy bolt opening and fast lock time, .00017 seconds. Striker tension is easily adjusted. .062 firing pin diameter

» Three lever trigger adjustable from 6 ounces to 4 pounds, single and two stage pull standard. Trigger adjustable white action is in the stock.
Hanger for Jewell trigger available (*deduct $95*).

» Conventional or Vee block bedding standard, three recoil lug options available. Vee block bedding allows interchangeable barreled actions.

» Drilled for scope and sight mounts. Redfield base and Picatinny 25" minute rail available.

» Weight (including Barnard trigger) is only 48 ounces.

» Stock, bedding Vee blocks and trigger guards available.

MT ...not empty™ GUNS

www.mtguns.com
MTGuns@earthlink.net
805.720.7720
PO Box 12547
Zephyr Cove, NV 89448

Price: $995- *Actions with ejectors, dual and offside port's slightly higher.*

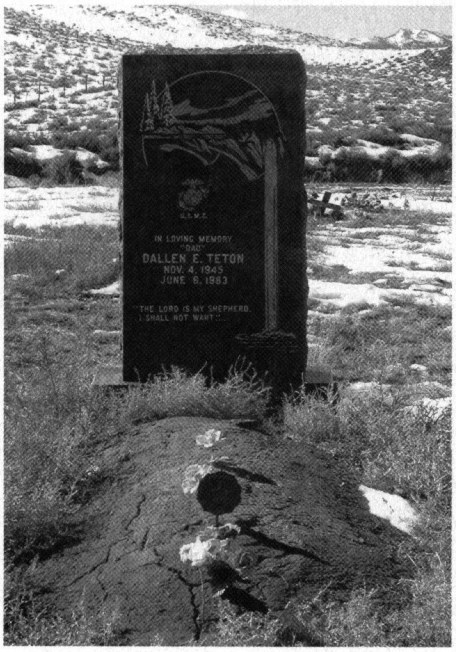
Canada: Robertsons Composites Inc. • 613.228.7543

The Last Post – Sacajawea

Continued from page 74

Eastern Shoshone tradition. You will have to decide for yourself, but having the benefit of being onsite, I am inclined to believe the people with the rigorous, and well developed oral history. This is particularly true because it is based on stories and information from her own sons, among others.

Detractors say the woman known as Bazil's Mother, who was buried in 1884 cannot be Sacajawea for a couple reasons (besides wanting her to be in South Dakota). One argument is that if she was 100 years old when she died, she would have been 21 during the expedition, therefore she could not be Sacajawea. The other reason is that the woman called Bazil's Mother in the burial record went by the name Porivo (Chief Woman in the Comanche language). Here is where the literal interpretations by hidebound white historians may trip them up. As I reviewed the different versions, I was mindful of a quote from Nietzsche, "*Convictions* are more dangerous enemies of the truth, than *lies*". Perhaps it is arrogance to insist on using a few scraps of the white man's *written* records against the Shoshone's strong oral history. And, remember the point I made a few pages ago that ages for the native Americans were approximate due to the lack of specific records. Sacajawea was born *around* 1788. If you used that as a hard date, she would have been about 96 or 97 in 1884. Back then, that would have been considered close to 100, and Bazil had told Reverend Roberts, who wrote her death record, that she was "about 100." No one knew for certain.



The stone for Dallen Teton, Marine. He did his part to help keep us free, as so many other Shoshone have through the foreign wars. One wonders if the model for the coin was a relative of his.

One other group also objects to the thought that Sacajawea died at the Wind River Reservation. The Lemhi branch of the Shoshone believe that if she was a good, traditional Lemhi Shoshone that she would have returned to her homeland and rejoined the people there. There is no record, oral or written that she did so, and they do not seem to espouse a specific resting place. Two things might counter this point. If she found her own sons living somewhere else, surely she might have preferred to live with them rather than among a group of people who, to her, might have seemed strangers. She had been gone a long time, and she already knew that some of her contemporaries had been killed. She had continued the expedition with Lewis and Clark when she might have remained with the Lemhi. Another consideration is the reports that she liked the whites, and emulated their dress and ways to a large extent. She might have lost her Lemhi-ness over time. It is difficult to know her thoughts and feelings after 200 years.

The rest of the story, according to the Shoshone on the Wind River Reservation, is that Sacajawea left Charbonneau about the time they returned from St. Louis. Speculation is she was tired of his beatings and other abuses. He had a history of brutality with women that was traced back as far as 1795 when he raped a young Saultier woman and was stabbed by her mother while engaged in the act. The timing would have been good for Sacajawea. She had just left her precious son in Captain Clark's good hands, and had no other dependents at the time.

According to tradition, she found her way to the Comanche, relatives of her Shoshone tribe, and settled there with a new husband. Jerk-Meat and Sacajawea had about five children, at least three of which died as infants. One surviving son was named Ticinnaf. Some of her children survived long enough to have offspring, who eventually discovered their cousins at the Wind River Reservation after Sacajawea's death and exchanged stories about their grandmother. It was during her time with the Comanche that she changed her name to Porvio. Sacajawea may have found reason to remain incognito – in later years, as the whites flooded to the west, anyone who had helped the Voyage of Discovery open the west to settlement became less popular among the oppressed natives.

Sacajawea-Porvio returned to the Shoshone after the death of Jerk-Meat. She made history among the Eastern Shoshone during the signing of the treaty at Fort Bridger in July 1868 whereby the Wind River Reservation was established. She was there at that time, and the only woman who rose and spoke at the Great Treaty Council,

held before Chief Washakie signed the treaty. This action was so unusual as to be remembered, and spoken of by those present, into their own old ages, many years later. Old stories relate that after the treaty council, Sacajawea helped Chief Washakie in tending to the welfare of the tribe, certainly a right and duty of a tribal elder. In an odd twist of fate, Chief Washakie, who was about ten years younger than Sacajawea, had lived for a while among the Lemhi, the people of her birth.

Sacajawea came under the care of her adopted son, Bazil, once she settled at the reservation. He made sure she was well taken care of. Records indicate that she was given good provisions by the agent, and that her family was treated with respect. During her time at the Wind River Reservation, Sacajawea continued to use the name Porvio, and seldom spoke of her journey with Lewis and Clark except to close family and the Reverend Roberts. There are a number of official records and other documents that record her death in 1884 and burial at the Sacajawea Cemetery. A stone was placed there, and the Reverend recorded her burial ceremony in his records. Is the marked grave in that cemetery really hers? There persists yet one more oral tradition among the Shoshone. That tradition says that although the Reverend performed a ceremony for her after a grave was prepared, she is actually interred in a cave, in a canyon, up in the Wind River Mountains to the west. Outside her cave lie the bones of her horse, sacrificed and left for her use whenever she needs to travel from there. Having visited the cemetery, and knowing the Winds intimately, I think she might prefer such a location for eternity rather than the cemetery itself.

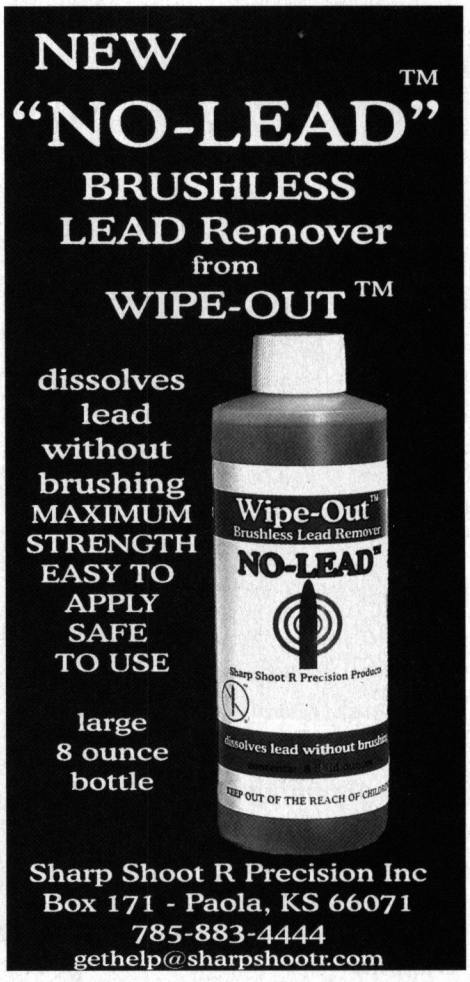
You might think *that* was the end of the story, but there is more. The controversy has continued to bubble up at points in the 20th century, and even in the year 2000 when a dollar coin in her honor was minted by the United States Treasury. In 1963, Wyoming state organization of the Daughters of the American Revolution erected a large granite stone, to replace the original stone marking Sacajawea's grave. This action caused howls of protest from the camp that holds she died in 1812 and is buried in an unmarked grave in South Dakota.

In the year 2000, there was much ado about choosing an enslaved native American woman who had merely acted as an interpreter for the Lewis and Clark expedition as the new representative for women's leadership in justice and liberty. In fact, an article in the Minneapolis Star Tribune in June 1998 said, "The new coin was supposed to bear the image of an American woman who took a stand for liberty and justice. And the only woman they could name was a poor girl recorded in history for her ability to beat dirty laundry on a rock?"

Wow! Talk about ignorance, prejudice, and sexism! From what is known of her character, that is certainly an uninformed and insulting characterization. Those who spoke of knowing her in her late years described her as a dignified, quiet, unassuming woman who was greatly respected, and recall Clark's words back in 1806 "...she inspired us all." The coin reportedly also stirred up hard feelings among the Lemhi Shoshone because it was not a member of their band chosen as the model for the artwork – no likeness of Sacajawea was made when she was a young woman. Artist Glenna Goodacre, wanting a Shoshone woman as a model recruited Randy'L Teton, a member of the Shoshone-Bannock tribe in New Mexico. Ironically, there is a gravestone for Dallen Teton, a US Marine who may have been killed during active duty, in the Sacajawea Cemetery not far from her statue. Is he related to Randy'L?

A visit to the Sacajawea Cemetery is an oddly moving experience. The humble cemetery is on a dry hillside in semi-desert. Un-irrigated, invaded by alien weeds, and populated by many native Americans who had short lives, the place wrenches the soul. Crowded, bare-earth grave mounds, many with simple wooden crosses, some with plain, river-worn boulders as markers, evoke strong emotions. Even at the end of winter, though, the great care and attention devoted to the dead is poignant. Most of the

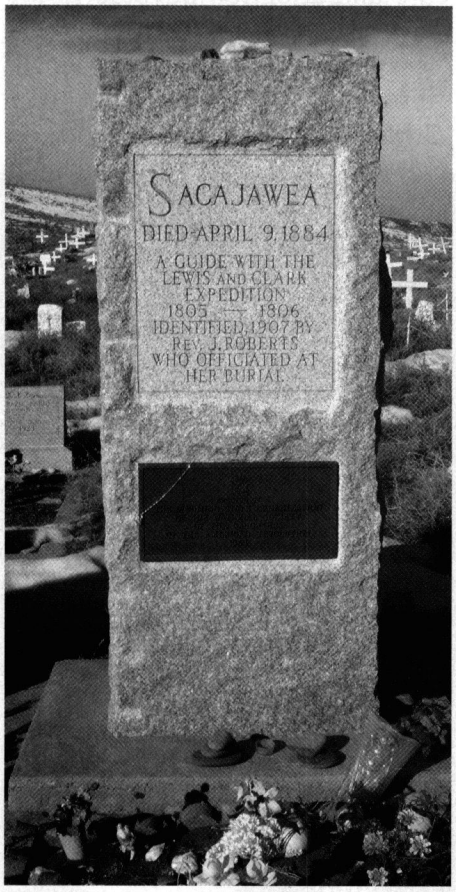
Continued on next page



The Last Post – Sacajawea

Continued

graves have artificial flowers, and many have special offerings or ornaments. The wooden crosses have often been carefully hand decorated. The weathered markers and unadorned boulders on the oldest graves reflect the poverty of the people then. Greater affluence shows in some newer grave markers. The tall granite marker for Sacagawea's grave plot, set between smaller stones for her two sons, stands out prominently. A bronze plaque commemorates the placement in 1963, and a marble bench in front of it provides one a place to sit and contemplate. I expect Sacagawea might be bemused and perhaps a bit embarrassed by the conspicuousness of that large stone erected for her.



Sacajawea monument was erected by the Wyoming Daughters of the American Revolution, dedicated with a bronze plaque in 1963, amidst outcries from the group espousing her burial in South Dakota.

The great reverence felt for her, even now, is evident in the host of artificial flowers and small tokens and trinkets adorning her memorial plot, and even her statue which stands higher on the hillside. Both sites have large collections of smoothly rounded pebbles and pennies. The grave mound has collected toys, bracelets, necklaces, polished tiger-eye, sand dollars and other seashells, medals, a silk scarf, sweetgrass, and many other small offerings. There are several piles of small stones on and around the granite monolith. I don't know if it is still true, but I have found reference that back in the 1950s, the Shoshone looked to Sacajawea to intercede in times of great need. Perhaps some of the small tokens are offerings by supplicants with just causes.

The bronze statue was cast by the Eagle Bronze foundry in Lander, Wyoming, and installed in 2002. Rendered by Bud Boller, a local Shoshone artist, it depicts Sacajawea wading into the Pacific and holding a sand dollar in her right hand. When I was there someone had placed several blue artificial flowers in the folds of her skirt, and one had fallen between her feet. Pebbles and pennies abounded around her bare toes, and a medicine bag, holding sacred sweetgrass, is tucked into a fold in her skirt. I wonder if she would be surprised at the controversy and reverence she still evokes more than two hundred years after that famous journey. This statue is one of dozens, installed across the country, commemorating her famous trek with Louis and Clark. Sacajawea is no doubt the most remembered and legendary member of the Lewis and Clark expedition.

One last note: Two of the many of Sacajawea statues have been stolen in recent years. The most recent theft was of a bronze statue at the site of Fort Clatsop in Oregon. There was a lot of press coverage, the local populace was outraged. In late January of 2008 the statue disappeared. A month later it was found, irreparably

damaged. A small time criminal (sentenced in March 2008) had stolen it and cut it up to sell the bronze for cash. Such an ignominious end for a memorial to the woman who still captivates our imagination and reverence after two centuries.

SOURCES:

Undaunted Courage, Steven E. Ambrose, A Touchstone Book, Published by Simon and Schuster. 1996.

Explorations Into the World of Lewis and Clark, Robert A. Saindon, Published by Digitial Scanning, Inc. 2003.

A Miracle at Square Top Mountain. Robert Franklin Leslie. Published by E. P. Dutton. 1979.

http://www.pbs.org/lewisandclark/inside/index.html a PBS website

http://www.sacajaweahome.com/ a grant funded site

http://www.windrivercountry.com/windriverres/shoshonefront.html

http://www.rootsweb.com/~nwa/sacajawea.html

http://www.nps.gov/archive/jeff/LewisClark2/CorpsOfDiscovery/TheOthers/Civilians/ToussaintCharbonneau.htm

http://www.yvwiiusdinvnohii.net/News2000/0300/DRider0000308SacajaweaDollar.htm

http://www.wshs.org/wshm/lewisandclark/sacagawea.htm

http://www.lizzarddesign.com/sacagawea/hist/dollar.html coin

Manley Oakley

Long-time Pacific Northwest benchrest shooter Manley Oakley passed away on Monday, March 31, 2008. He was 92 years old. Manley, lately of Olympia, Washington, a retired steel worker, is survived by his son Craig, daughter Marcene and two grandchildren. His wife June preceded him in death.

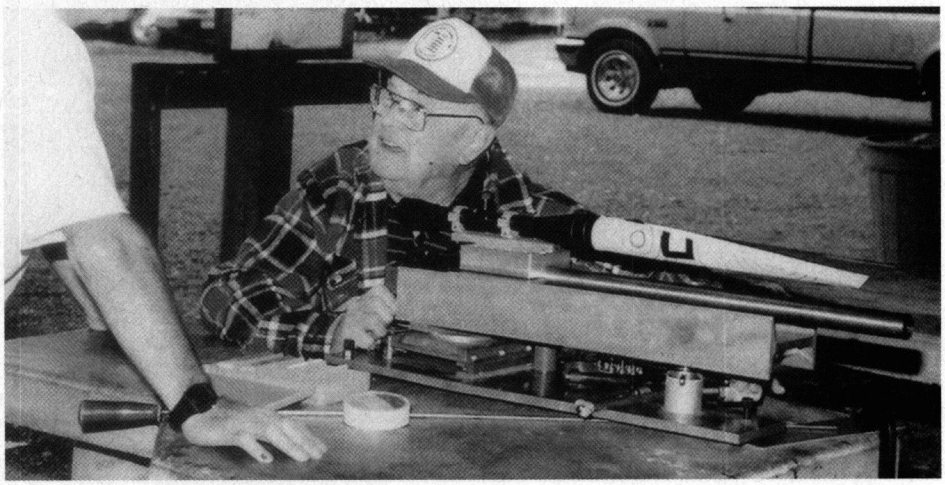
Oakley was an NBRSA Life Member, serving as a NBRSA Regional Director of the Northwest region for two terms. He was a very active shooter until 2002 when he suffered a stroke and was unable to compete any longer. His benchrest career began about 1962 as a member of the Puget Sound Benchrest Rifle Club near Seattle; the oldest benchrest club in the country.

Manley was known as a top-notch BR riflesmith in the region and was credited with many innovations in BR tools and equipment, all produced in his basement shop. He was also known as a tireless promoter of the sport and a mentor to many new shooters in the area. One of his inventions was a novel barrel twist deviation machine which pointed out the importance of twist deviation to shooters; not to mention some barrel makers of the day. He also designed the official Hunter Benchrest Class scoring device about 1985 and a first-class bullet spinner enjoyed by several users around the country. When Puget Sound lost its range in 1989 he was instrumental in helping to move BR to Tacoma Rifle & Revolver Club, helping to design the range and a new backer system.

Manley Oakley was known and well-liked by many shooters around the country. He was one-of-a-kind and will be missed by most of his acquaintances and all of his friends.

We Are Diminished

Authored by Jim Folwell



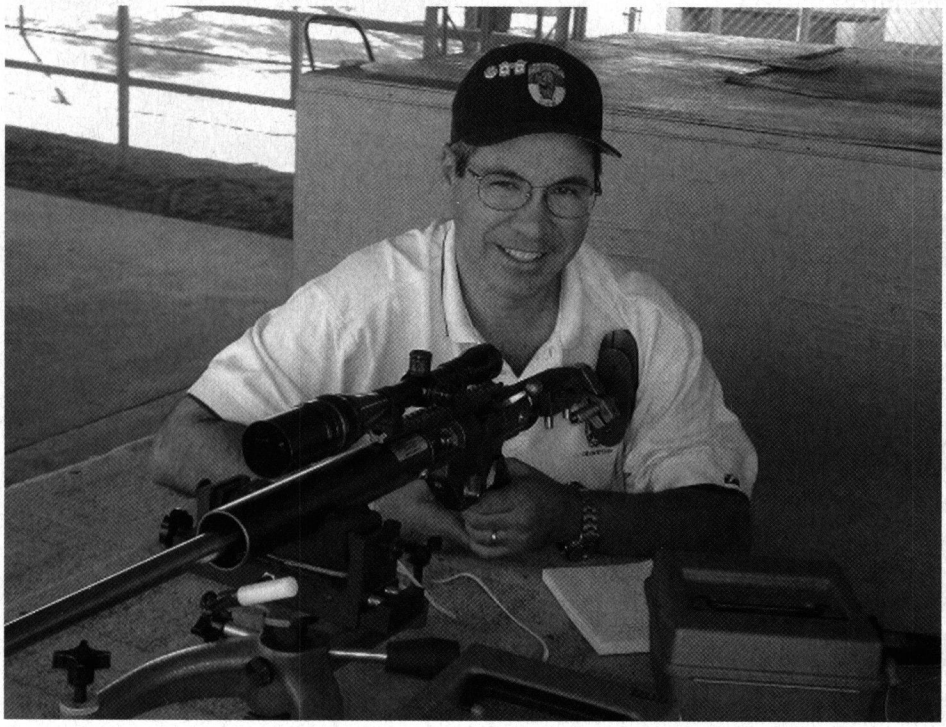
Manley Oakley

A Match Primer Study In The 6BR Cartridge

BY GERMAN A. SALAZAR

Primers are a frequent topic of discussion among reloaders and match shooters. However, we seem to know less about primers than we do about most of the other components we use in making our ammunition. I don't claim any special expertise in primer design or manufacture; however, I have, over the years, paid close attention to the performance of different primers in my loads and developed a great interest in primers. What follows is a somewhat detailed presentation of my primer study using the 6BR Norma cartridge (hereafter 6BR), including some historical background into match primers that I hope the reader will find informative.

What do we seek in a primer? What characteristics will the ideal primer encompass? A primer, like most things in the industrial/mechanical world, embodies a number of characteristics which must be balanced with respect to each other in order to have a useful, manufacturable and affordable product suitable for sale to the general reloading market comprised of hunters, plinkers, tinkerers and match shooters. Our interest, as the title of this article suggests, is somewhat limited, we are concerned only with a primer's performance in the competitive arena. Accordingly, we seek accuracy and we further seek an understanding of the factors which contribute to accuracy. There are no earth-shattering discoveries here, only a few more steps on the journey of inquiry into the invisible world inside the barrel.



German Salazar with the Borden/MAK Tubegun test rifle.

Selecting a primer for a given load or cartridge is a task that every careful handloader faces with a large degree of uncertainty and some trepidation. Will the primer be compatible with the powder? Will it create higher pressures? Will it stand up to the pressure? Will it increase or decrease accuracy? We can obtain a fair amount of information about the burning rate of various powders and their suitability for a certain applications, yet most handloaders are in the dark when it comes to

understanding the primer's effect on the load. Manufacturers try to guide us by labeling primers as "Match", "Magnum", "Bench Rest" and other appellations contrived to catch our eye at the sporting goods store, but none of these terms tells us much, if anything, useful about the primer's effect on the load. Do primers have an equivalent to a "burn rate"? Can we somehow predict a primer's performance? Are there any shortcuts to shooting a lot of rounds over a chronograph and into a target? Is there a fuller meaning to the raw numbers we see from a chronograph? All of those questions plague us and we will try to address them in a manner that will guide the thoughtful handloader towards better performing loads.

HISTORICAL BACKGROUND

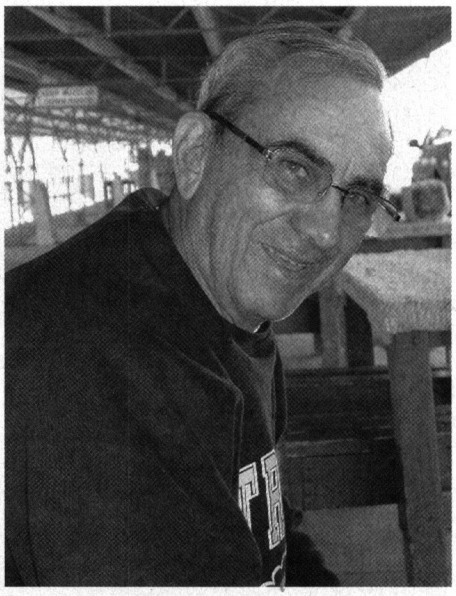
The primer, while small, has always been an important part of the accuracy equation of match grade ammunition as it has an influence on pressure and velocity well out of proportion to its size. Reviewing references covering ammunition as far back as the 1923 Frankford Arsenal International Match load for the 30-06, we find that arsenal and civilian reloading authorities often stated that a "softer" primer gave better accuracy. We can only wish that the literature produced then provided a better definition of what they meant by "soft" or how they measured it but we have to live with that omission.

Just prior to the turn of the 20th Century, Frankford Arsenal was loading the .30 US Army (30-40 Krag) with mercuric, corrosive primers which used ground glass as a frictionator to help start combustion. As the fulminate of mercury rendered the brass cases unsuitable for reloading, the non-mercuric H-48 compound was adopted at that time. Fired cases were regularly sent back to the armory for reloading in those times, making this an essential change. In 1910, the mixture was again changed, to eliminate the ground glass which was found to increase metal fouling in the bores. The new glass-free FH-42 mixture was still corrosive and non-mercuric.

In 1917, at the peak of production for war needs, a large batch of the FH-42 mix (already loaded into ammunition) failed to perform as required, causing the recall of millions of rounds of ammunition, some already in France. The Winchester developed 35-NF formula was given to Frankford and subsequently adopted as the FA70 mix. The FA70 was used in those 1923 International Match loads was the archetypal soft primer. It was corrosive, non-mercuric, and was valued for the fine accuracy it delivered. All government match ammunition through 1940, when production of match ammunition ceased, was loaded with the FA70 mixture (the primer itself was actually called the FA26 but is often referred to as the FA70). This primer was the gold standard of that era.

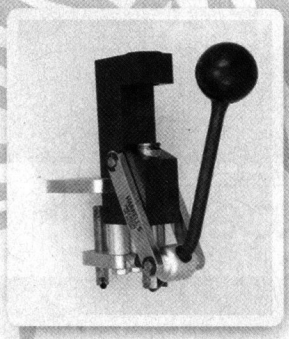
Frankford Arsenal, as well as the other government facilities producing and testing match grade

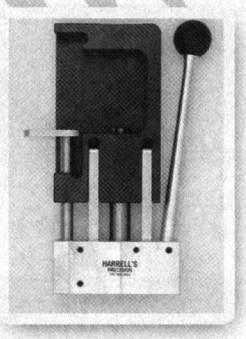
Continued on next page



Bob Jensen, our Oehler 43 wizard and the inspiration for much of this project.

Harrell's Precision

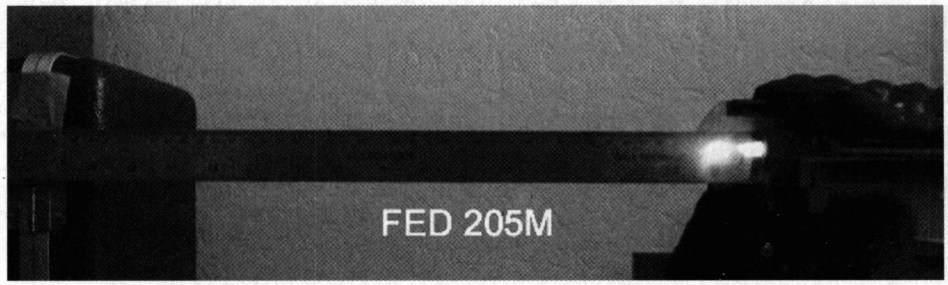




Combo Press
Rigid, portable, light weight and user friendly. Resize up to 30-06 length cases, including short MAG. 2 Rams - One for resizing and one for seating bullets with straight line Wilson dies. Comes with a removable heavy duty C clamp.
Price - $275.00

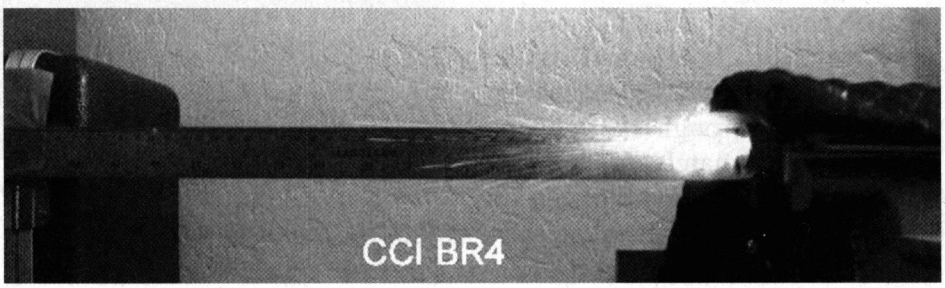
Compact Press
Compact C press for resizing at the range. Strong, simple design. 3 sizes - PPC, 308, and Mag. bullets can be seated with Mag size. All have built in C clamp.
Price - $160.00

Lynwood, Walter Harrell
Harrell's Precision
5756 Hickory Drive
Salem, VA 24153
(540) 380-2683
www.harrellsprec.com

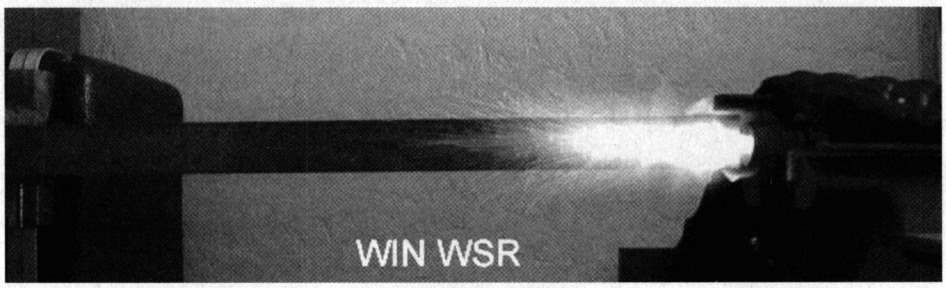


Federal 205 M primer flash.

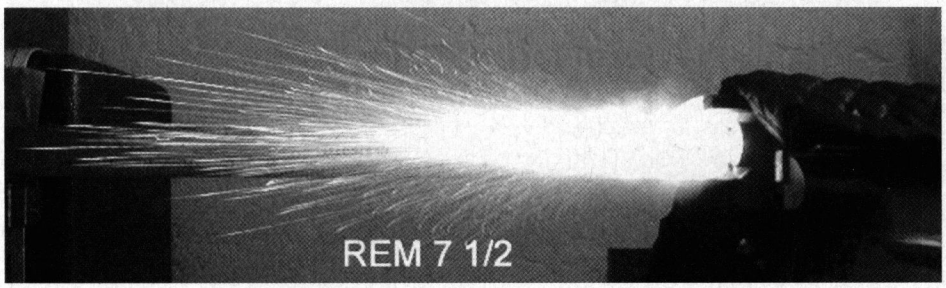
PMC (Russian) Small Rifle Magnum primer flash.



CCI BR4 primer flash.



Winchester Small Rifle primer flash.



Remington 7½ primer flash.

A Match Primer Study In The 6BR Cartridge

Continued

ammunition had facilities that we, as amateur handloaders, can barely fathom. Their testing comprised millions of rounds of ammunition and the search for accuracy in support of the National Match, International and Palma ammunition programs was relentless. The Frankford and Lake City Arsenals developed and tested the components and methods of manufacture that led directly to today's match grade components from commercial manufacturers. I am unabashed in my reliance on their guidance through the articles and books which were generated from that vast store of knowledge.

For many years after their introduction, non-corrosive primers were considered harsher and less accurate and thus were not used in arsenal loaded match grade ammunition. Given the government's facilities and test programs, we cannot doubt the conclusion that the softer primers were more accurate. Unfortunately, despite a great deal of research, I can find only minimal quantitative, anecdotal or illustrative definitions of the meaning of "softer" as applied to primers. One example can be found in the book: *Complete Guide to Handloading* by Philip B. Sharpe (Funk & Wagnalls, 1937). Mr. Sharpe, a highly regarded authority on reloading and other technical topics, sets forth load data for both corrosive and non-corrosive primers with the latter being reduced by 3.2 grains in one representative 30-06 match load with the 173 gr. bullet and HiVel #2 powder. Other loads were similarly reduced and there is a general warning to reduce all loads formulated with corrosive primers by 5%

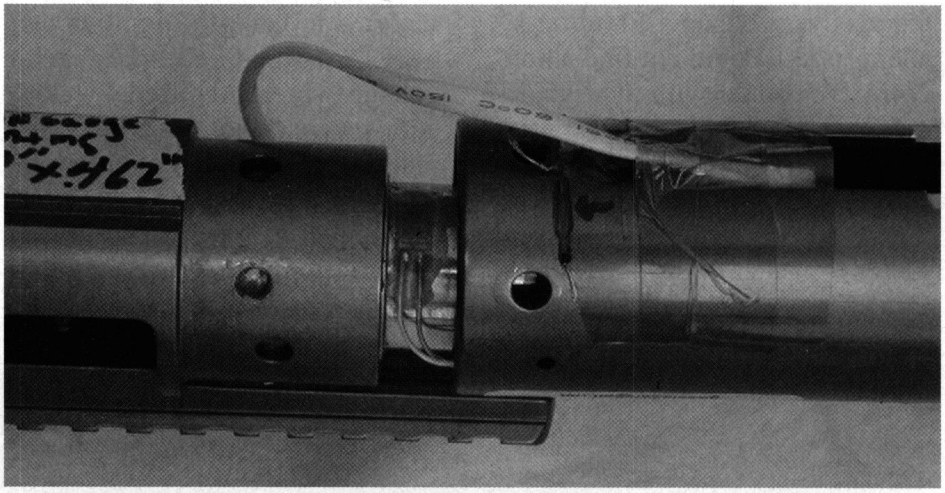
when using non-corrosive primers.

Another quantitative indication of the relative meaning of a "soft" primer can be found in Al Barr's "Loads for the '06" (*American Rifleman*, April, 1949 p. 28). This was the period of transition, when non-corrosive primers were gaining wider acceptance and handloaders were becoming acquainted with their characteristics. In his reloading tables, which were compiled with the assistance of the H.P. White Labs pressure testing facility, Mr. Barr shows a 7,000 Psi increase in pressure with the substitution of the new Winchester 120 (non-corrosive) primer for the FA26 in a standard 30-06 match load with IMR 4895. In the text, Mr. Barr states: "The powder companies have always advised a powder reduction of about five percent when substituting non-corrosive, non-mercuric primers for corrosive Frankford Arsenal 70 or FA26 primers when using maximum recommended powder charges. The reason, of course, is higher pressure caused by hotter commercial (non-corrosive) primers."

The recommended five percent powder charge reduction gives us some indication of the relative meaning of "soft". Perhaps it tells us that accuracy is more easily found when the influence of the primer on the overall pressure of the load is minimized; or perhaps only that there is a pressure level that must be maintained in order to develop maximum accuracy. Certainly however, a five percent reduction in the charge of a 30-06 increased air space in an already overly large case and that alone would have a detrimental effect on accuracy. With the broad range of powders available today, one can almost always find a powder that develops the desired pressure and velocity while giving close to 100% load density. In the immediate post-war years however, choices were fairly limited, the old standbys being IMR3031 and the then ubiquitous Hercules HiVel #2. DuPont's IMR 4895, IMR4320 and IMR4350 were all fairly new powders and 100% load density was not generally attainable.

The years between 1917 and 1950 were a bustle of activity in the primer field with efforts to develop non-corrosive primers such as the Swiss and German arsenals had developed being a top priority. Jim Burns, Remington's primer expert, developed the hugely popular Kleanbore non-corrosive primer for rimfire and centerfire cartridges which was introduced in 1926. Remington held patents on some important non-corrosive primer formulas, but the government was not idle. Frankford Arsenal worked with Berdan priming in corrosive and non-corrosive formulations. The Berdan primers were tried because the available non-corrosive mixes required a larger amount of compound than could be put into the Boxer type primers. The Berdan experiments were short-lived, however, and Frankford continued work on non-corrosive Boxer primers. While match grade ammunition was not the focus of the Arsenal's research, the controlled environment and relatively small lots of ammunition prepared for the National Matches (about 300,000 rounds annually at that time) provided a useful and

Continued on next page



Strain gauge attached to the barrel of the test rifle.

The BEST in The Business
dave MANSON PRECISION REAMERS*
Over 20 Years in the Reamer Business
** NEW! REM 700 TAP/MANDREL **
*Div. Loon Lake Precision, Inc.
Ph: 810-953-0732 8200 Embury Road, Grand Blanc, MI. 48439 Fax: 810-953-0735
Buy *The BEST* to Build The BEST

A Match Primer Study In The 6BR Cartridge

Continued

frequent testing ground for new developments.

In 1950, all US military rifle ammunition production was ordered changed to non-corrosive primers and that process was complete by late 1951; however, no match ammunition was being produced at that time. In 1956 Frankford Arsenal resumed small scale match ammunition production. It is interesting to note that despite all of the resources at their disposal, six years after the general changeover to non-corrosive primers in arsenal loading and thirty years past the time commercial ammunition makers' gradual changeover began, Frankford's chemists still could not find a non-corrosive primer with the fine accuracy of the soft FA26. Accordingly, the corrosive FA26 primer was used in the then new 7.62 NATO cartridge for the 300 Meter events at the 1956 Olympic Games in Melbourne. This special ammunition, designated T275 and later T275E4 and headstamped FA56 and FA56 Match, was the only US made 7.62 NATO ammunition with corrosive primers. As it was intended only for International teams, it received very limited distribution. The very small quantity of FA56 Match 30-06 produced that year became the last corrosive primed .30 caliber match ammunition produced at the arsenals.

Frankford resumed full scale production of 30-06 match ammunition in 1957 initially with the Remington RA70 non-corrosive primer mix. By 1958, Frankford had developed a non-corrosive lead styphnate based primer considered suitable to replace the famed FA26. Labeled the FA36, the new primer was reported to have soft ignition and gave excellent accuracy with velocity spread reduced by 20% and group size at 600 yards reduced by 10% over the FA26. Unfortunately, as the FA36 was not limited to use in match grade ammunition, it was quickly modified by the addition of zirconium to the mix to make it more suitable for extreme cold weather use, quite likely decreasing its accuracy potential to some degree.

The MAK stock is ideal for this type of work as the handguard completely shields and protects the strain gauge.

Frankford was not alone in holding on to the old primers for match ammunition; Winchester-Western continued using that company's corrosive and mercuric 8½ G primer in match ammunition (.308, 30-06, and .300 H&H) until 1960 when the 8½ G was finally replaced with the non-corrosive, non-mercuric number 120. Remington had long since switched to its non-corrosive Kleanbore primer in match grade ammunition. Thus, by 1960, all US made match grade ammunition was finally loaded with non-mercuric, non-corrosive primers in place of the old "soft" corrosive primers. (See: *American Rifleman*: Frankford Arsenal and Match Ammunition, April 1957 p. 40; Ammunition for the 1958 National Matches, Sep. 1958 p. 29; Match Ammunition Manufacture, Dec. 1959 p. 15; Barrel Life, Feb. 1960 p. 38; Corrosive Primers, June 1960 p. 60; Non-Mercuric, Non-Corrosive Primers, Jan. 1961 p. 34; National Match Ammunition, Aug. 1962 p. 22; 1963 NM Ammunition, Aug. 1963 p. 62; US Service Primers, Jan. 1966 p. 63; Non-Corrosive Dates, April, 1966 p. 63 and The Cal. 30 Cartridge in Match Competition, Sep. 1969 p. 42. See also: *The Book of the Springfield*, by Edward C. Crossman, Ch. 12 Ammunition Components, Small Arms Technical Publishing Company 1932; *Muzzle Flashes*, by Ellis Christian Lenz, Standard Publications, Inc. 1944 pp 651 – 760; *Hatcher's Notebook*, by MG Julian S. Hatcher (various references), Stackpole Books 1962; *Handloading* by William C. Davis, NRA 1981, Non-Mercuric, Non-Corrosive Primers, p. 20; and, *Ammunition Making* by George E.

Frost, NRA 1990, Primers and Priming p. 47).

With the foregoing background in mind, we set out to examine a sampling of modern primers. Our objective was to see if there is a correlation among several factors including visual flash, pressure, velocity and accuracy. While keeping in mind the historic significance of the soft primer, we approached this testing with an open mind as much has changed in 70 years.

PRIMER FLASH PHOTOS

The photos of the primer flash generated by each primer type are quite revealing, showing us a range in flash size of several orders of magnitude among frequently used match primers. Upon viewing the range from tiny flash to near blowtorch blast, with much in between, we were encouraged that we had a lead on the search for the modern day incarnation of the elusive soft primer. At a minimum, the range of visual flash suggested that there should be significant performance differences among the various primers.

While each primer type is represented here by a single picture, five to ten of each type were fired and photographed. Within a given lot of primers, the visual flash of each type was found to be very consistent. However, different lots of the same type of primer can show marked differences from one another. The lots used in the testing were selected randomly from those available, some were relatively new and some were quite a bit older (up to 20 years) but all had been stored in a temperature controlled, indoor environment.

TESTING METHODOLOGY

At this point, planning for the firing tests began. With the assistance of Bob Jensen, whose knowledge of ammunition and primers is encyclopedic, a testing plan was developed which would allow a useful comparison of the various primers. Lapua (Nammo Lapua Oy) generously furnished components for our testing and their contribution to the project is greatly appreciated. Given that Lapua does not presently sell primers in the reloading components market, their support is a clear indication of their selfless interest in furthering the knowledge base of reloaders.

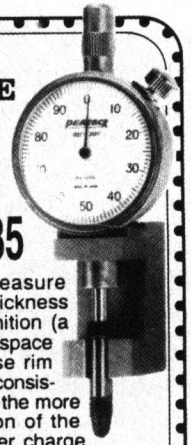
The results presented here are not meant to be determinative of a single "best" primer for all applications (or even for all 6BR loads). This is a study into some of the characteristics of primers and how, if at all, those characteristics may be related. While we tested a large number of primers, some of which are not available in the retail market, we will limit our presentation here to five types which are generally available to handloaders. These five are the Federal 205M, the Russian made PMC Small Rifle Magnum, the CCI BR4, the Winchester Small Rifle and the Remington 7½ Bench Rest. These primers present a fairly broad cross-section of visual flame production and we believe that a great deal can be learned from them. While some will be disappointed over our failure to include their favorite primer, we had to draw the line somewhere and these five present a useful range of performance.

With our test equipment in place, we began the pressure and velocity testing portion of this test. We first fired the reference ammunition provided by Lapua in order to verify the calibration of our equipment, using an Oehler 43 Personal Ballistics Laboratory system. Our pressure readings were within 100 Psi of Lapua's specification; this was determined to be well within acceptable limits. Having preliminarily established the accuracy of the system, and due to the relatively limited amount of the factory reference ammunition, we loaded a reasonably large amount of our own reference ammunition to approximate the factory pressure and velocity. This was done using new Lapua brass, Lapua 105 grain bullets and VihtaVuori powder. One of the test primers, which had previously shown a very high level of consistency, was selected to be used in our reference load. All primers were seated with the Sinclair tool which has proven to be one of the best tools for this purpose.

To the extent possible, SAAMI

Continued on next page

The NEW
BALD EAGLE
Rimfire Cartridge Gage
"The Gage That Works!" $85



This is a gage to measure consistency of rim thickness on .22 rimfire ammunition (a .22 rimfire rifle's headspace is determined by case rim thickness). The more consistent the rim thickness, the more consistent the ignition of the primer and the powder charge in the case. In other words, the firing pin will fall the same distance every time if the same rim thickness is used on every case being fired for a particular group. By sorting the shells into various groups by rim thickness, a reduction in group size of up to 25% can be realized in some IF NOT MOST rimfire rifles. This information about group reduction comes from the .22 rimfire benchrest participants who compete in the extremely difficult BR-50 matches. All of the top shooters sort their shells into groups by checking rims and weighing the unfired cartridges.

BALD EAGLE
Precision Machine Company
101-A Allison St.
Lock Haven, PA 17745
TEL (570) 748-6772
FAX (570) 748-4443
Bill Gebhart, Owner
(NRA Benefactor - IBS Life Member)

A Match Primer Study In The 6BR Cartridge

Continued

testing procedures were used as a guide for our testing. However, there are many variances from those procedures. Most notably our use of a strain gauge pressure measuring system (Oehler 43) rather than the SAAMI standard copper crusher or piezoelectric transducer method as both of these are beyond the scope of our budget and facilities. Further, as the 6BR cartridge is not covered by SAAMI standards, the exact location selected for placement of the strain gauge was based on our understanding of the principles involved and the study of similar cartridge specifications in the SAAMI guide. Despite these variances, we believe the results obtained to be reliable and repeatable. (See: *Voluntary Industry Performance Standards for Pressure and Velocity of Centerfire Rifle Sporting Ammunition for the Use of Commercial Manufacturers*, American National Standards Institute 1992, 1999)

STATISTICAL FIRING TESTS

Firing our reference ammunition showed it to compare quite favorably with the factory product in terms of consistency and met our goal of having a larger supply of reference/calibration ammunition. While our reference load was slightly lower in pressure and higher in velocity than the factory reference ammunition, it was within CIP specifications for the 6BR Norma and produced very consistent pressures. This difference is most likely attributable to our unavoidable use of a canister grade powder as the factory powder is not available to reloaders. The factory reference ammunition was subsequently used to check the equipment prior to each session and our handloaded reference ammunition was used before and after each test to ensure that external factors such as ambient temperature were properly accounted for.

All testing for this article was done with a Borden action with new Krieger 1:8" twist barrel, 30" long chambered in 6BR by Lester Bruno and stocked in a MAK Enterprises Tubegun stock. The scope used was a Leupold BR 24 with the Tucker coil spring modification. Accuracy tests conducted prior to the primer tests showed this to be a very accurate rifle for its intended purpose: prone shooting at distances of 300 meters to 600 yards. The load used for the tests is the same as our reference load except for the primers, these being the only variable element. Each test firing consists of ten shots.

Table 1 summarizes the results of the test firings for pressure and velocity. Each primer test was fired twice, the test sessions being one week apart. Ambient temperature ranged from 70 to 74 degrees F at the first session (A) and from 67 to 72 degrees F at the second session (B). The primer tests were fired in inverse order in Session B to determine if barrel heat was a contributor to the noted changes in pressure. Nonetheless, in both tests, firing was conducted in a manner calculated to minimize the effect of barrel temperature changes and barrel temperature was closely monitored.

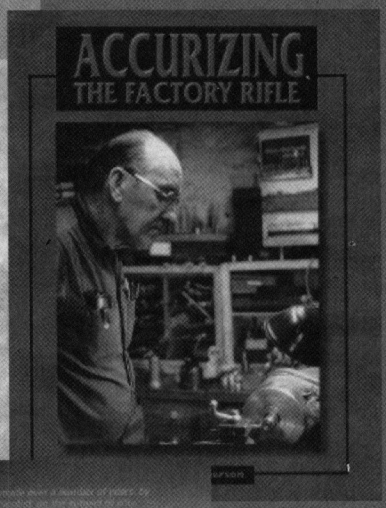
We collected data for muzzle velocity (gross, SD and ES), chamber pressure (gross, SD and ES), area under the pressure curve which is a measure of total energy produced, and rise time, which is a measure of the time from ignition to peak pressure. Both rise time and area under the curve were so close for all primers that much more firing would be needed to determine if there is any statistically valid difference among them. However, both muzzle velocity and chamber pressure showed the variances that reloaders have come to expect from different types of primers.

A glance at Table 1 will indicate a difference in average velocity between sessions for each load that is greater than warranted by the ambient temperature change between those sessions. That is just one of the many frustrations the amateur ballistician faces. Frankford Arsenal chronographed over permanent screens placed 100 feet apart with a tolerance of 0.01" in a controlled

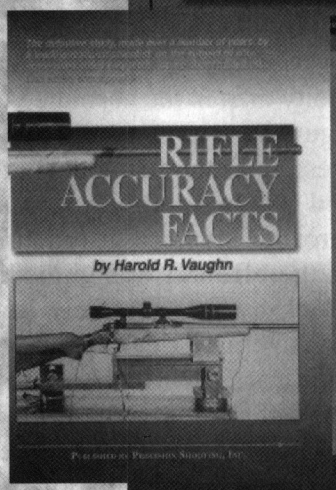
Continued on page 88

BLACK POWDER CARTRIDGE & CLASSIC GUNS
The Single Shot Exchange
Since 1991 MAGAZINE
Subscribe & Receive a FREE 50-Word Ad! (a $15.95 value)
About Guns Made or Designed before 1920
The Monthly Antique Arms Reader, Resource & Reference
Monthly Updated Buy-Sell-Trade Lists • In-depth, Right Off-the-Range Shooting & Product Information • "How-To" & Technical Articles • Product Reviews • Historical & Collectors Stories • Busy "Letters & Queries" Section • Match Schedules & More!
Comprehensive for Beginners & Old-Timers Alike
FREE Sample Issue
Send $35 for 12 fully loaded issues to: The Single Shot Exchange
Dept. G, P.O. Box 1055, York, SC 29745
Call for Subscription Rates Outside U.S.
VISA MasterCard Visa/MasterCard Accepted
Ph/Fax: (803) 628-5326

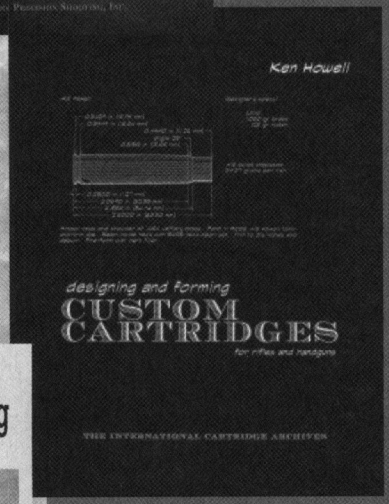
SERIOUS ABOUT RIFLE ACCURACY?



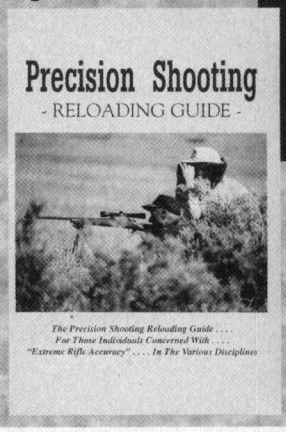
Accurizing the Factory Rifle, by M. L. McPherson. "Approximately twenty per cent of the populace are complete failures at anything mechanical at all... some ten per cent of the populace are born with more mechanical aptitude than seems reasonable... and that leaves seventy per cent of humanity to fall between the two extremes". And here we have a book for the seventy per centers! Author M. L. McPherson (*Metallic Cartridge Reloading*, as well as *Cartridges of the World*), aided and abetted by over 400 photos, tells the reader how to improve the accuracy of just about all rifle action types (bolt, lever, pump and single shot). A long awaited book that bridges the gap between the rudimentary (mounting sling swivels, scope blocks, etc) and the advanced (precision chambering, barrel fluting, etc.) books that are currently available today. Softcover, 335 full size (8 1/2 x 11) pages. **$44.95**



Rifle Accuracy Facts, by Harold Vaughn. Following World War II (where he flew 100 combat missions in P-47s and P-51s in the Pacific Theatre) the author joined Sandia National Laboratories in New Mexico, where he became recognized as the grandfather of the Aeroballistics/Flight Mechanics Technology base for nuclear ordnance... obviously a pretty brainy guy. Throughout the last few decades he became fascinated with rifle accuracy as an avocation, and specifically the age-old question of why some rifles shot better than others. Today his book on the topic has been widely hailed as the most important work in the field since the 1909 classic work by Dr. F. W. Mann, **The Bullet's Flight**. Softcover, 292 (6 1/2 x 10 1/4) pages. **$34.95;** Hardcover, **$39.95**



Designing and Forming Custom Cartridges, by Ken Howell. The classic work in its field, out of print for several years, and virtually unobtainable on the used book market, now available once again. Some 600 pages, full size (8 1/2 x 11), including some 450 pages of approximately 900 cartridge cases, all drawn to the same scale. Precisely drawn to the dimensions specified by the men who designed them, the factories that made them, and the authorities that set the standards. There's also 150 pages of case forming info and advanced handloading data. Hardcover. Oversized book, additional shipping charge. **$59.95**



The Precision Shooting Reloading Guide. Edited by Dave Brennan. A reloading guide like no other... not a reloading manual, but rather a how-to guide for various shooting disciplines. Chapters include how-to for: an overview of extreme accuracy reloading, reloading for highpower (bolt gun), reloading for highpower (gas gun), reloading for benchrest, reloading the magnums, reloading for wildcats, pouring and loading cast bullets, and working up an accuracy load. Spiral bound, 284 (5 1/2 x 8 1/2) pages. **$22.95**

ORDER NOW: AT PRICES SHOWN ABOVE. **Order from:** Precision Shooting, 222 McKee Street, Manchester, CT 06040. Shipping and Handling in the US is $3.50 for first book, $5.00 for multiple books. (Add $1.50 additional shipping for Ken Howell book). Foreign orders (including Canada) **will be shipped economy mail unless air is requested and** will be charged actual shipping costs plus $1.00 handling. Visa or Master Card orders accepted without surcharge at our CT office (860) 645-8776 phone; (860) 643-8215 fax. CT residents add 6% sales tax; NY residents add 4% sales tax.

A Match Primer Study In The 6BR Cartridge

Continued from page 86

environment. We must make do with environmental changes, a much more modest (and manageable) separation of four feet and somewhat greater tolerance from session to session in both screen spacing and muzzle to screen centerline distance, especially the latter. Accordingly, I place more emphasis on the pressure readings and the variability of both pressure and velocity than in the absolute velocity figures.

The results of the firing data are presented below in tabular format and the reader may draw some inferences therefrom. I was immediately struck by the relatively low range of average peak pressure among the various primers; given the visual differences in the flash, I expected a greater range. Nonetheless, there is a direct correlation between the size of the visual flash and the pressure generated by each primer: the larger the flash, the greater the pressure. Velocity follows pressure within reasonable limitations, and since the only variable in these loads was the primer, we can see a very direct relationship there as well. As an initial point of analysis, we can broadly say that more flash equals more pressure and more velocity.

Perhaps more interesting is the data showing the variability of each load. While many reloaders focus on extreme spread (ES or range) of velocity, I much prefer to focus on the standard deviation (SD) as it is statistically a better measure of expected performance of any given shot. The same holds true for pressure data, the SD of the peak pressure readings tells us something useful about the primer's ability to function in a consistent manner in a given load.

It is in this analysis of the data that our predicted correlation between flash size and pressure breaks down. Note that the "small flash" primers, Federal and PMC, had similar peak pressure SD figures. The "medium flash" primers, CCI and Winchester, however, did not perform similarly at all. The CCI was in line with the small flash primers whereas the Winchester produced the largest peak pressure SD of the test. And then appeared the biggest surprise of the test: the Remington with its ferocious visual flash and highest average peak pressure nonetheless produced the lowest SD of peak pressure; although interestingly just an average SD of velocity.

Our selection of primers and Lapua and VihtaVuori reloading components.

ACCURACY FIRING TESTS

If the statistical tests had some small but unavoidable systemic flaws (environment, set-up), the accuracy testing presented even more of a dilemma. Our readership is a sophisticated group which understands the methods and standards of benchrest competition. Ideally, the accuracy firing tests would be conducted with a return to battery rail gun at 300 meters. The problem is I am not a benchrest shooter, do not own a rail gun nor have access to one. However, I am an experienced prone shooter and have good equipment for that shooting discipline that serves every need of this testing procedure. Therefore, the most practical option open to me was to conduct the accuracy firing tests from the prone position. I added a scope to the test rifle as noted above in order to minimize aiming error but the human element is a distinct part of this portion of the test. Given that our test cartridge, the 6BR with a 105 grain bullet, is more commonly used as a prone and position shooting cartridge, than as a benchrest cartridge, I don't think that this is a significant flaw in our testing. Each accuracy firing test consisted of 15 shots.

How much variablity could we

expect in accuracy from the primer differences? The staff at Frankford Arsenal was of the well grounded opinion that the bullet accounts for 90% of a cartridge's potential accuracy, with the powder, primer and case accounting for the remaining 10% ("Factors in Accuracy", *American Rifleman* July, 1958, p. 30). With that cautionary prelude firmly in mind, we began the firing tests.

Test firing was conducted at the Ben Avery range in Phoenix at 600 yards. Our focus was on vertical dispersion differences among the various primers. Given the range of pressure and velocity variations, we expected to see some vertical dispersion differences and that was indeed the result obtained. Table 2 summarizes the outcome of these firing tests. Interestingly, the order of the vertical dispersion of each load could almost be predicted based on its pressure/velocity/flash. However, once again, the Remington 7½ which had the larget flash and highest pressure performed better than predicted, winding up in the middle of the pack for vertical dispersion. Perhaps the low SD of pressure generated by the Remington is its saving grace; that will be an area for further investigation. Keeping the Remington exception in mind, we can otherwise see a pattern of lower pressure/velocity/flash being related to reduced vertical dispersion at 600 yards.

The study of primers is an ongoing fascination for me, as they are a vital, yet often overlooked part of the accuracy system. I will continue this work with a series of tests on large rifle primers, hopefully we'll find something interesting there as well. What I hope you will retain from this article is that primers are sufficiently different as to merit testing in your loads and perhaps something about their history and characteristics. If you conclude from this article that A, B or C is the "best" primer, then I have failed because it is not my intention to make any such pronouncement, but to examine a variety of primers in a single load and a single rifle so that we may examine the primers themselves in as pure a manner as is possible. My objective is to explore and to learn, not to make absolute judgments.

This testing conducted for this article would not have been possible without the generous assistance of Lapua who provided us with factory loaded 6BR ammunition to use for pressure, velocity and accuracy baseline data as well as reloading components for the test. Our sincere thanks and appreciation goes to the good people of Nammo Lapua Oy. I must also acknowledge the contributions of Bob Jensen. Bob, who is well known in the Palma shooting community for his coaching skills and his memorable work loading of the 1992 Palma ammunition, has been a good friend and patient mentor to me in many endeavors and I am very grateful for that. Last, but not least, Jim Cobb and Nate Silverman's technical assistance with many aspects of the testing was invaluable.

Table 1 Statistical Firing Tests

Primer	Test No.	MV Avg.	MV SD	MV ES	Pressure Avg.	Press. SD	Press. ES	Area Under Curve	Rise Time
Federal 205M	A5	2811	4	14	50,900	800	2,200	452	161
Federal 205M	B18	2840	7	22	51,800	800	2,200	464	151
PMC SRM	A6	2827	6	16	51,800	1,000	3,500	457	151
PMC SRM	B17	2854	8	22	52,800	900	2,700	466	151
CCI BR4	A7	2840	8	22	53,200	900	3,300	463	150
CCI BR4	B16	2845	11	32	52,900	700	2,200	464	152
Winchester SR	A8	2845	7	21	53,500	1,200	3,800	464	150
Winchester SR	B15	2834	9	21	52,300	1,300	4,100	460	151
Remington 7 1/2	A9	2843	6	17	53,900	400	1,400	469	151
Remington 7 1/2	B14	2838	8	28	53,300	500	1,900	470	151

Table 2 Accuracy Firing Tests

Primer	600 Yd. Mean Vertical (6BR Prone)	600 Yd. Vertical Range (6BR Prone)
Federal 205M	0.64"	2.50"
PMC SRM	0.68"	2.81"
CCI BR4	0.97"	3.50"
Winchester SR	1.20"	4.38"
Remington 7 1/2	0.91"	3.19"

Niedner Model 1924 Rifle

BY MICHAEL PETROV

I'm not sure what year this rifle was designed or for that matter when the first one was built. I named this rifle the Niedner Model 1924 because that's the date on Mr. Niedner's rifle. The serial number is No. 3 so there could have been a year or more between No.1 and Niedner's Rifle marked No. 3. This was one of the rifles that Niedner's friend Bill McQuerry brought to Alaska in the 1950's. I found it for sale on a gunshow table in Anchorage in 1980. I bought the rifle and quietly took it home to Kasilof. I was playing my cards close to the chest in those days because I was still on the trail of other rifles of Niedner's that had been sold here in the state.

The Niedner Rifle Corporation (NRC) located at Dowagiac, Michigan had introduced the .22 Rimless Niedner Magnum cartridge that was based on the necked-down .25 or .30-Remington case. The cartridge has an overall length of 2.38" with a 22° shoulder and a case length of 1.90". There was also a .22 Rimmed Niedner Magnum base on the necked-down .25-35 WCF case. Published information on this cartridge from the Niedner Rifle Corporation catalog was:

26.0 grains No. 3031, 45 gr. SP
Bullet 3035 fps
25.0 grains No. 3031, 63 gr. SP
Bullet 2919 fps
25.0 grains No. 4064, 63 gr. SP
Bullet 2687 fps
26.5 grains No. 3031, 55 gr. SP
Bullet 3305 fps

This very same loading data was later published in ***Wildcat Cartridges*** by Richard F. Simmons, 1947 and ***Twenty-Two Caliber Varmint Rifles*** by Charles S. Landis, 1947. It looks like the velocity numbers were transposed between the 45 grain and 55 grain bullet in the Niedner Rifle Corporation catalog and then copied in the other books. If my friend John Wills had not caught it I would have done the same thing.

This cartridge was most often used in Remington Model 30 rifles, introduced in 1921, that had been originally chambered for the .25 or .30 Remington cartridge. NRC also made a cartridge they called the .22 Baby Hi-Power, designed by Emil Koshollek, of Stevens Point, Wisconsin. This cartridge was the .32-20 WCF necked to .22 with a case length of 1.30" and an OAL of 1.675". One new idea of this rifle would be to

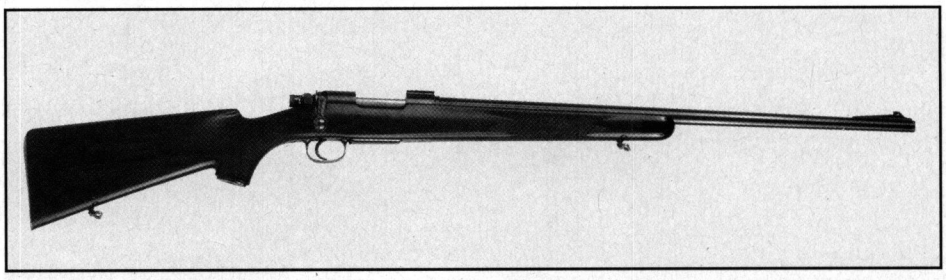
have a rifle built in size more along the lines of the smaller cartridge. I was able to learn that at least three, possibly four of these rifles were made. One of these rifles was kept in the shop as a model to show customers, one went to the owner of the Niedner Rifle Corporation, William Stolly, and one, No. 3, went to A.O. Niedner.

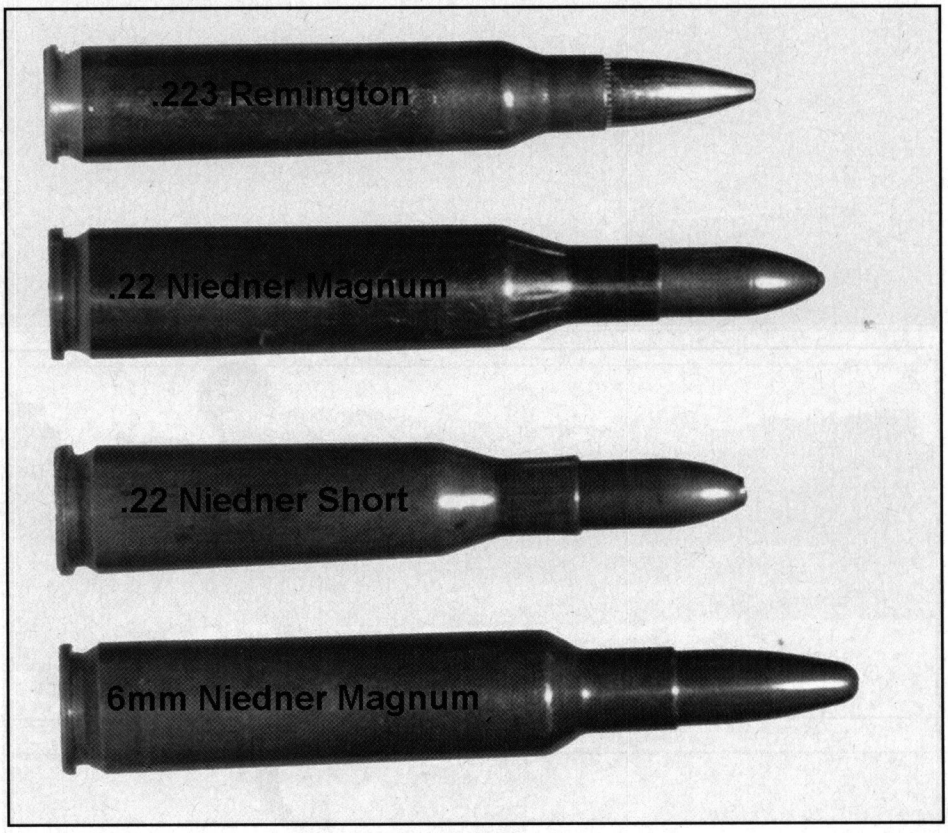
I have examined one other of these rifles. It is not marked with any name nor does it have a serial number. I was told, but was never able to verify, that Mr. Stolly gave his rifle to a guide in Canada. I spent some time trying to trace it but with what little information I have I've had no luck at all.

A short action rifle was a great idea but it just never got off the ground nor was it produced in any numbers. By the time the bugs had been worked out and before they could tool up along came the Depression and this project had to be put on the shelf. It would have been unpractical as well as unprofitable to try to hand make each rifle. N.H. (Ned) Roberts spent two weeks at the Niedner Rifle Corp. in 1928 working with the then new .257 Roberts and wrote an article about his visit in the November, 1928 ***American Rifleman*** called **"A Visit To The Niedner Rifle Corporation"**. In the article he has this to say about the new rifle.

"Mr. Niedner also has perfected a new bolt action that is more simple, stronger and generally superior to the Springfield, Mauser and any other bolt action now on the market. Two notable features of this action are: first, there is no external visible motion

Continued on next page





STRAIGHT(er) SHOOTIN'

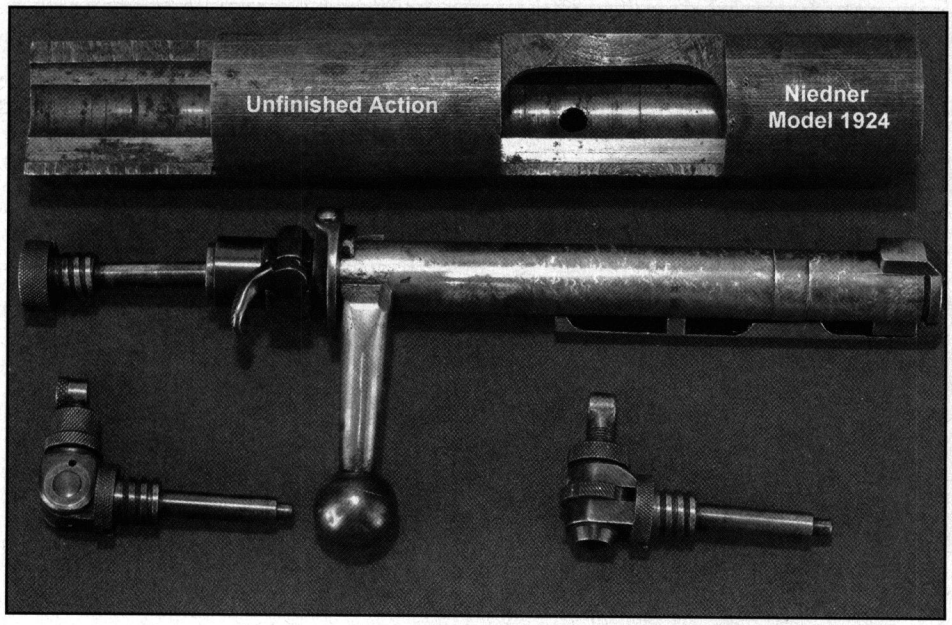
CryoPlus-treating your precision gun barrel will improve accuracy, eliminate barrel warping, extend barrel life, increase velocity, and relieve barrel stress. BUT DON'T TAKE OUR WORD FOR IT:

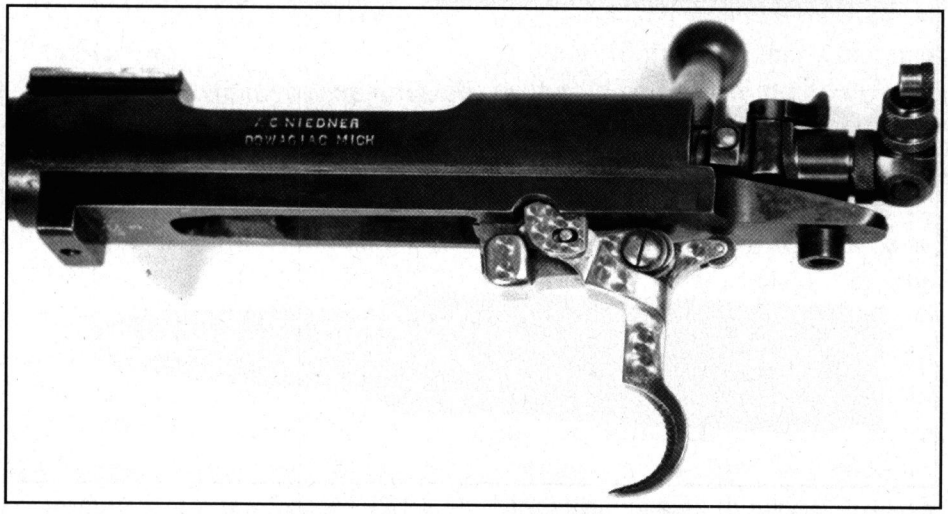
"Frozen barrels thread and chamber easier and leave a better finish."
Borden's Accuracy

"The throat does not erode as fast. Barrels that have over 2,000 rounds look like they have less than 100 rounds put through them."
Kelbly's Inc.

CryoPlus®

2429 North Millborne Rd • Wooster, OH 44691 • P: 330-683-3375 • F: 330-683-2653
E: kathi@cryoplus.com • www.cryoplus.com





DIE BLANKS

NEW!
17-4PH
Stainless Steel

Limited Quantity
TEST RUN
17-4 Stainless
You buy them
we'll make more!

Improve Accuracy!
Use your custom chamber reamer to finish your custom die for the perfect match between cartridge and chamber.

Ready to Ream
Pilot hole sizes 17 to 338 Cal. Use standard 3/8 x 1/2 Wilson, Redding, Hornady bushings.
New 17-4PH or 416 Stainless and 12L-14

17-4 Stainless
SIZING DIE

NEWLON
PRECISION

2465 Coachman Rd. Mariposa, CA 95338
(209) 966-8141 Fax (209) 966-8142
www.newlonprecision.com e-mail newlon@sti.net

Niedner Model 1924 Rifle

Continued

of the firing pin when the rifle is fired; second, by removing one master pin, the action is easily and quickly taken apart without the use of any tools whatever. This new action is adapted to any cartridge from the smallest centerfire to the highest power magnum cartridges. The action will be placed on the market by the Niedner Rifle Corporation as soon as possible."

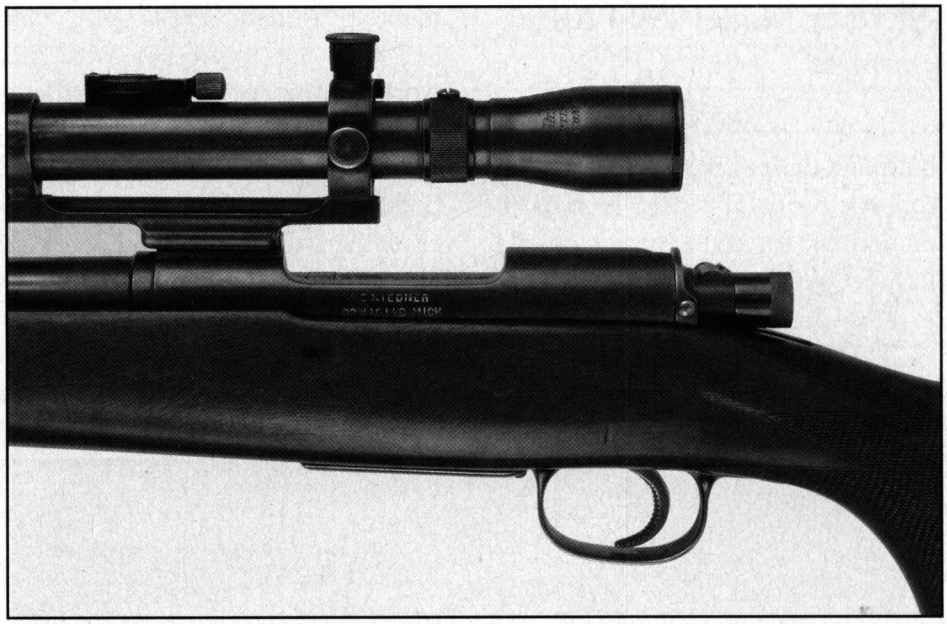
I have examined two of these rifles plus the unfinished receiver and have never seen one of them in any length except the short action size. I'm not saying that they did not make a larger action; I've just never seen one. The bolt is easily taken apart by removing the end cap, all of which can be done without tools. The bolt has a safety on the side as well as a gas shield to protect the shooter in case of a blown primer or ruptured case. There is a small hole in the back of the bolt with a pin that just barely protrudes when the bolt is cocked, acting as a cocking indicator. When the end cap is replaced with the bolt peep, it has a corresponding hole, so there must have been a longer pin used when the peep sight was installed. This rifle has one of the best triggers I have used on any rifle. Notice the small roller at the back of the trigger in the picture. There is no creep, slack or over-travel, it's just a fine piece of workmanship. There was no rear sight with the rifle. About four years after I bought the rifle I was visiting with my late friend Gerald Kelver in Colorado, also a friend of Niedner, and had bought many things from him. While Kelver was showing me a box of goodies we

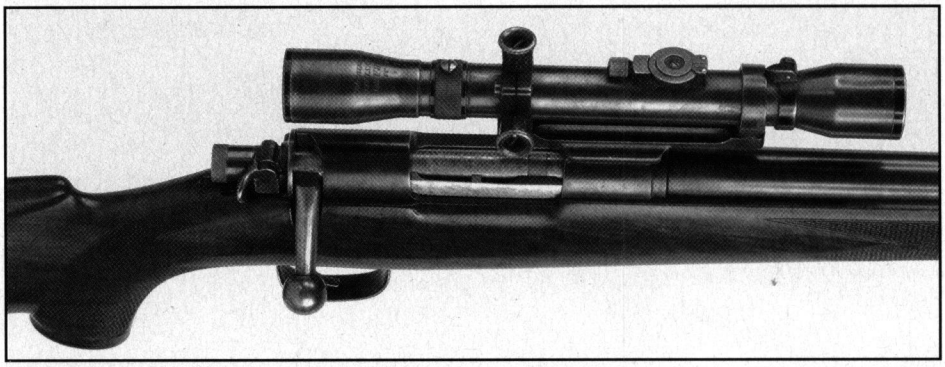
were looking at two bolt peep sights trying to figure out what they could have been made for when the little light bulb over my head lit up. The unfinished action came from another man who had some of Niedner's things.

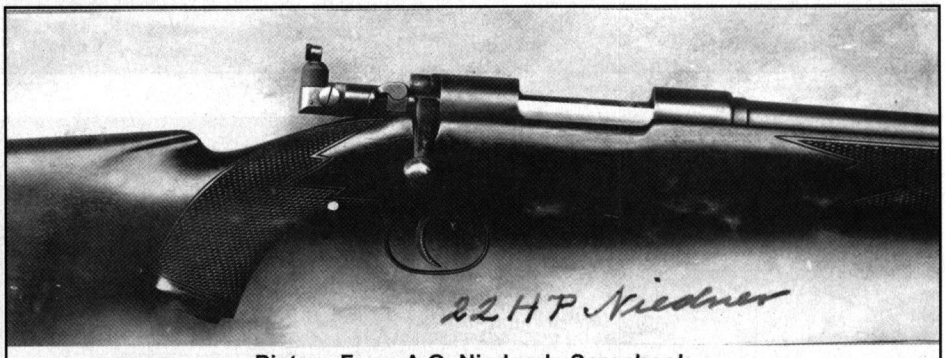
Niedner's Rifle Serial No. 3 is chambered for a .25-Remington necked to 6mm (.243). During the later years at the Niedner Rifle Corporation they were making and experimenting with several different 6mm cartridges. I have no idea when this cartridge was developed. In a box of case-making tools, bullets and cartridges that came from the Niedner estate is the pictured Short .22 Rimless Niedner cartridge that Niedner had been experimenting with. The only place I have ever read about this "Short" cartridge is in ***"Twenty-Two Caliber Varmint Rifles"*** by Charles S. Landis 1947 with reference to a letter from Tom Shelhamer dated June 13, 1945. In this same letter Tom Shelhamer says that he recalls they made up four of the Model 1924 rifles at the Niedner Rifle Corporation.

The German scope is mounted in a set of Winchester A-5 mounts adapted to a single Mann-Niedner taper block base on the receiver. The classic stock was made by Thomas Shelhamer using a nice piece of Circassian walnut with twenty-four lines-per-inch checkering, an ebony forend tip and detachable sling swivels that are mounted in German silver escutcheons. Tom Shelhamer was hired as the stockmaker at the NRC in 1924 so this would have been built his first year with Niedners'. There is a Niedner style trapdoor

Continued on next page





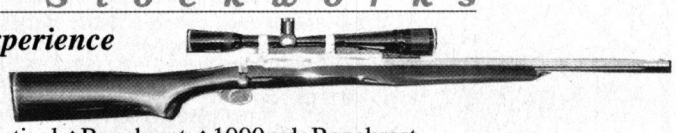


Picture From A.O. Niedner's Scrapbook

T M S t o c k w o r k s

Over 25 Years of Experience

SPECIALIZING IN



♦Hunting ♦ Varmint ♦Tactical ♦Benchrest ♦1000 yd. Benchrest
♦Rimfire Benchrest ♦Sniping ♦High Power♦ Block Bedding of Fiberglass Stocks
♦Pillar Bedding of Wood Stocks ♦Glue-Ins ♦Stock Painting ♦Bluing
& the ***TMBR Stocks*** - **"Rides the Bags Like No Other"**

Please visit web site for complete list of services offered.

Telephone/Fax: 260-485-5389 ♦ 6355 Maplecrest Rd., Fort Wayne, IN 46835
E-Mail: tmstockworks@comcast.net ♦ Web Page: www.tmss.net

Niedner Model 1924 Rifle

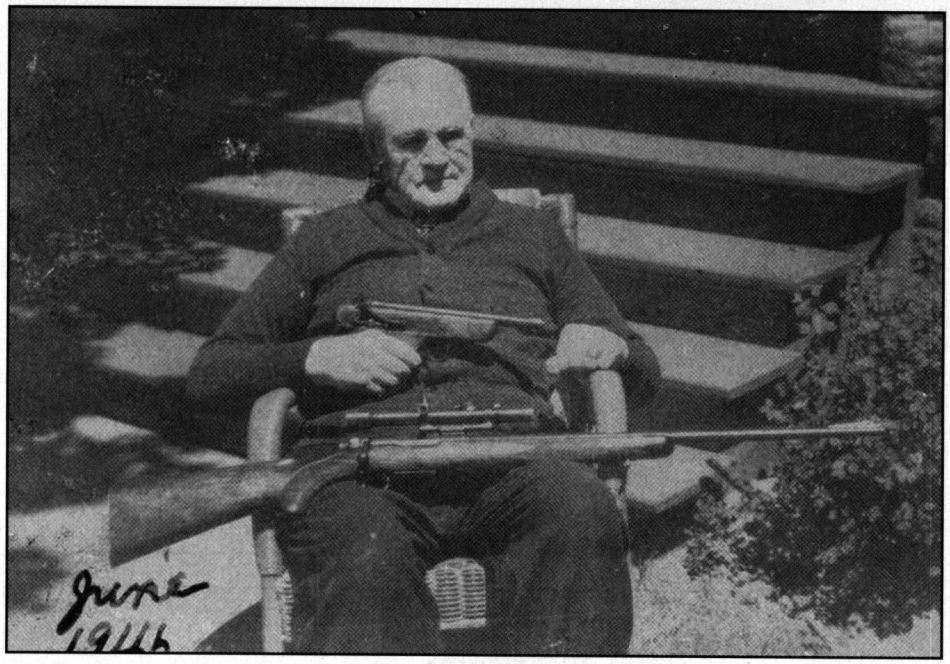
Continued

buttplate with a five-piece cleaning rod enclosed. The rifle is marked on both the top of the barrel and the left receiver:

A. O. NIEDNER
DOWAGIAC, MICH.

The bottom of the receiver is marked **"3"** and **"1924"**.

I was not impressed with the workmanship of the other rifle I looked at. It's possible it was a tool-room action that was later finished into a rifle. If that is the case then there could have been five rifles total, not four. I believe that one may still be in Canada somewhere but after twenty years of looking I guess it could be anywhere. The rifle pictured in Niedner's photo album has a bolt-peep sight, the other rifle I looked at did not have one and did not look like it would take either of the two I have so there is a little more evidence that there are more rifles out there.



When I got rifle No. 3 it came with about twenty rounds of loaded ammo and forty rounds of brass. I never had dies made for the rifle using a neck sizing die and a bullet seating die made for another cartridge. I shot the rifle some in the first few years that I had it but after doing more research and learning how few of these rifle were made I retired it. It's a shame that this rifle never got beyond the development stage but then a lot of good things in the firearms field were invented but never saw widespread use. As far as I have been able to learn nothing about the rifle was ever patented. It would be great if one of the other rifles were to show up so that we might learn a bit more about this project.

Today the Niedner Model 1924 rifle is little more than a footnote in the history of the American Sporting Rifle. An example of what might have been had the economic times been better in America in the late 1920's. These are not the only rifles Niedner built from scratch. He built two Mann-Niedner Model 1912 rifles and at least three Mann-Niedner Model 1913 rifles that I hope to write about in the future. Until then keep your eyes open for any Niedner marked rifles.

NEW from K&M SERVICES

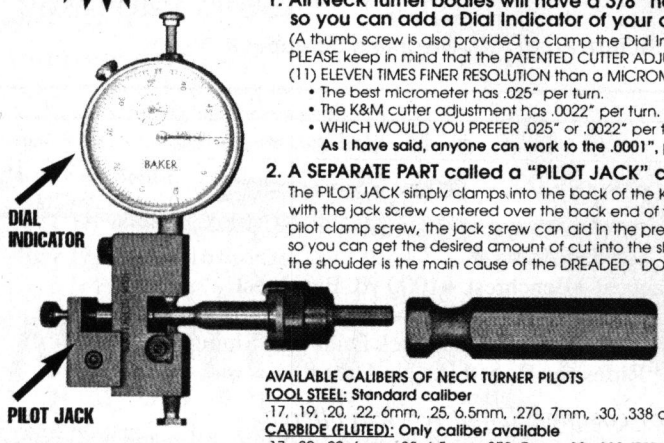
K&M MICRO ADJUSTABLE NECK TURNER

IN ADDITION TO THE DREADED DOUGH-NUT REMOVER, THE FLUTED CARBIDE PILOT

ADDITIONAL OPTIONS ARE NOW AVAILABLE

1. All Neck Turner bodies will have a 3/8" hole so you can add a Dial Indicator of your choice.
(A thumb screw is also provided to clamp the Dial Inidcator in place.)
PLEASE keep in mind that the PATENTED CUTTER ADJUSTMENT HAS (11) ELEVEN TIMES FINER RESOLUTION than a MICROMETER.
• The best micrometer has .025" per turn.
• The K&M cutter adjustment has .0022" per turn.
• WHICH WOULD YOU PREFER .025" or .0022" per turn? **That should be a no brainer. As I have said, anyone can work to the .0001", picking the right one is the trick.**

2. A SEPARATE PART called a "PILOT JACK" can be purchased.
The PILOT JACK simply clamps into the back of the K&M NECK TURNER body with the jack screw centered over the back end of the pilot. By loosening the pilot clamp screw, the jack screw can aid in the precise positioning of the pilot so you can get the desired amount of cut into the shoulder. Insufficient cut into the shoulder is the main cause of the DREADED "DOUGH-NUT"!



U.S. PATENT #5,309,801

Other Products Available! Call for FREE Catalog

AVAILABLE CALIBERS OF NECK TURNER PILOTS
TOOL STEEL: Standard caliber
.17, .19, .20, .22, 6mm, .25, 6.5mm, .270, 7mm, .30, .338 and .50BMG.
CARBIDE (FLUTED): Only caliber available
.17, .20, .22, 6mm, .25, 6.5mm, .270, 7mm, .30, .338 (50BMG limited quantity)

5430 SALMON RUN RD. • DOVER, PA 17315 • (717) 292-3175

It Worked for Joe

BY HOKE KERNS

Honest Injun! After a more than 70-year layoff, would you consider *beginning* to shoot competitively again if you were 90 years old? **Joe Shaw** did. His urge to compete again prompted the development of a new more powerful optical booster now available for shooters, young and old, who need – or just want – ever more power in their scopes. More on the booster in a minute; but first, there's more on Joe.

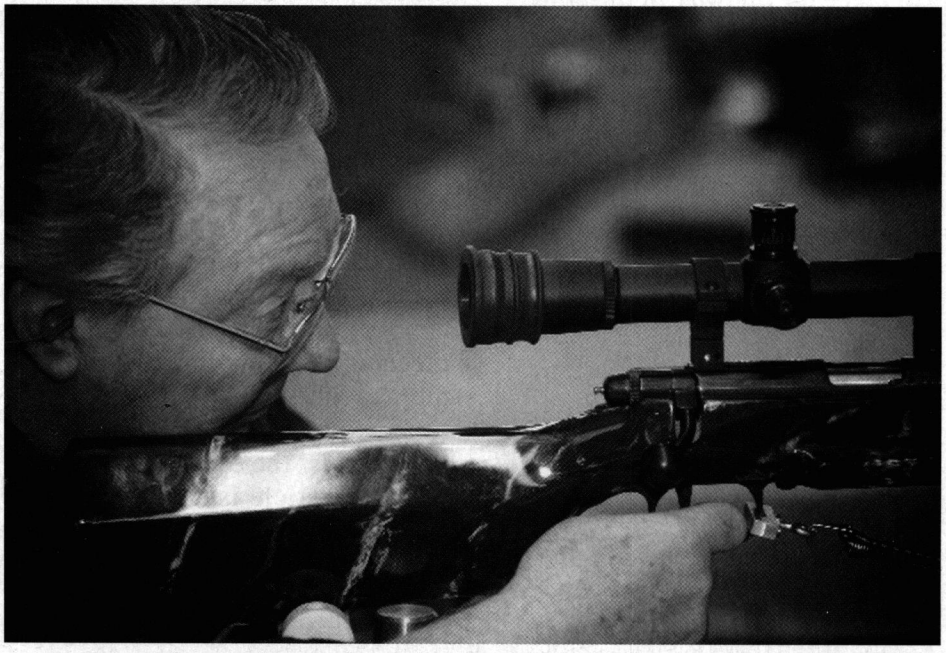
Joe is a 90 year old World War II veteran who was among the first of the combat engineers to cross the Siegfried Line in General George Patton's Army. High school shooting team experience (his only earlier competitive shooting) and using a rifle to put meat on the table preceded his demonstrated ability with a rifle in the Army.

Precision Shooting was told that Joe had been a heavy equipment operator, inventor and woodsman, like his father and his grandfather before him. He lives in a very small 20 foot by 20 foot house inherited from his father in Augusta, Maine. The house has no running water and is heated with a wood stove. But, he has a satellite-fed television set, drives a Jaguar automobile and "still chases the girls."

After a nearly 80-year layoff, Joe wanted to shoot competitively again. Kelbly's made him a rimfire action and stock. Joe then sent those components to rimfire gunsmith, **Gene Davis**, to barrel the receiver, finish the stock, fit it with and adjust the tuner and provide match ammo for the rifle.

Sensitive to the declining eyesight of a 90-year-old shooter, Gene topped the completed rifle with a 45 power Leupold competition scope. Even then Joe was unable to see the target dot clearly and asked for more power! A good friend of Joe's, **Bill Rocque**, who had years of experience with optics and their development, worked with various lenses and Joe until Joe could finally see the dot and the target. Bill also served as the go-between Joe and Gene during the building of the rifle. Joe and the

Continued on next page



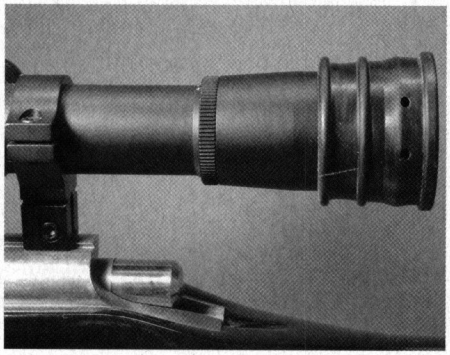
Rimfire gunsmith, Gene Davis, at the bench with the new 4x optical booster in place.

It Worked For Joe

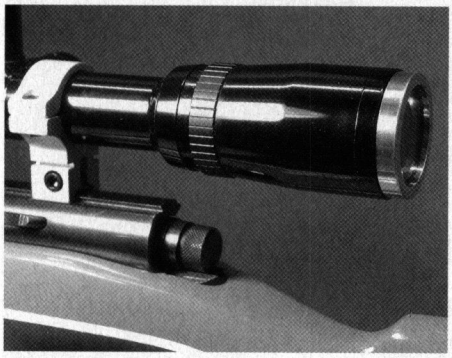
Continued

rifle were now ready. You may be surprised at the results.

The results of Bill's experience with Joe prompted him to ask Gene if others might be interested in a newly developed lens which would boost the image in their scopes. Gene tried one and jumped right in. Their first market-ready booster was tested and reported on by **Dick Wright** last year (**PS**, November 2007, pp 27-30). That initial booster was 3x.



After the booster is slipped into position the eye piece of the scope will have to be adjusted again. Instructions suggest turning the eye piece all the way in and after the booster is installed turning the eye piece back out until the reticle is again sharp.



The 3x booster can be supplied threaded to match the eye piece threads on most popular scopes. In this instance it is screwed into place on a 36x Bausch & Lomb Elite 4200.

That first 3x booster increased the power in a 36x scope to a little over 45 power. It easily screwed into the eye piece of a Bausch and Lomb or Leupold scope. It was also supplied with a little rubber sleeve which slipped over the eye piece and held the booster lens in place on those scopes whose threads didn't match. It was an effective accessory which caught on with a lot of rimfire and centerfire benchrest competitors.

That 3x booster is still in production and available. Development work on the lens, however, had continued and Gene was to introduce the results of that work to those who gathered at the Rocky River BR Barn for RBA Unlimited Indoor Nationals in March.

The new booster is not only more powerful, **Joe**, it contains a host of technical improvements as well. **PS** was given one of the first of the new lenses for testing.

To begin with it is 25% more powerful, 4x. A 36x scope with the new booster in place is increased to 50 power! Put it on a 45x competition Leupold and it increases power to well over 60x. At 50 yards that little .22 caliber bullet hole looks like it was made with a 30 caliber rifle. And, there is no observable reduction in brightness. There is a small reduction in the field of view but what difference does that make when the target is only 24 inches tall and/or wide at 50 yards?

In the package containing the booster lens was an installation suggestion. It recommended loosening the lock ring of the scope's eye piece and turning the eye piece all the way in. Then after slipping the rubber sleeve containing the booster on adjust the eye piece back out until the reticle is sharp. Fix it in place with the locking ring. Never one to read the instructions first, the booster was slipped onto the eye piece of a 45x Leupold competition scope and, of course, the reticle was fuzzy, just as the instructions predicted.

Turning the eye piece in almost to the stop made the reticle sharp as a tack. So much for instructions! It was also pointed out that the booster, in its rubber sleeve, can be moved as far as one-half an inch back from the eye piece and this movement will further increase the observed boost of the scope.

This new 4x booster comes contained in a sleeve of special rubber which retains its strength and elasticity from 320 degrees to 50 degrees below zero. It is offered with a lifetime warranty.

Lenses are made by a famous German optical manufacturer from a "dual polymer," whatever that is. Lens coatings consist of anti-scratch, ultraviolet light protection, low light and anti-reflectives along with some other "proprietary" coatings. The "dual polymer" lenses are the same military specification lenses approved for eye wear by the U. S. military. That process is also used for anti-blast armoring on U.S. military vehicles where safety is also the primary concern.

Gene claims the 4x power lens reads mirage and adjusts to zero parallax finer than a scope without the booster. Limited testing seemed to confirm this to be true. Even in relatively low light the 4x booster appears to bring forth an enhanced picture of the target which is true and perfectly proportionate. The reticle and target proportion are exactly as you would see them without the booster; they're just closer and the reticle stays in exactly the same proportion to the target/sight picture.

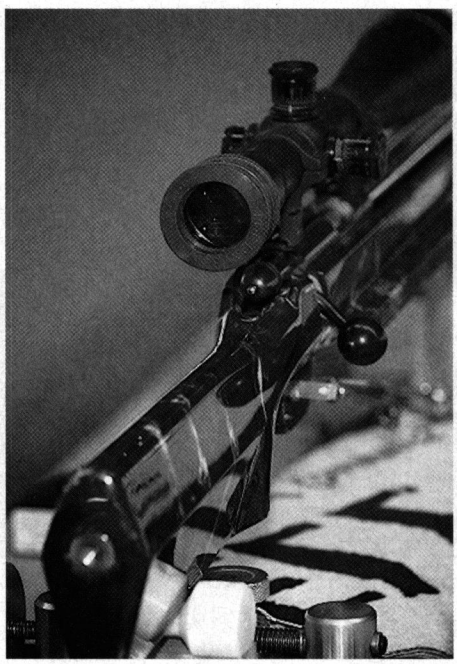
Ten percent of any profits from the sale of the boosters go to not-for-profit organizations supporting America's military veterans, primarily Camp Stand Down Lives, Inc. which is a U. S. veterans service organization dedicated to helping all honorably discharged veterans in need. Funds are used mostly for transitional housing, food and clothing. Swan Industries said they will be proud to make this

10% profit for products sold in European countries and others around the world available to their respective veterans organizations.

That 3x booster worked for Joe. In his first competition in nearly eighty years he came in third in his state. That was in 2006. He was ill and unable to compete in 2007.

The 3x booster is available from Gene Davis, postage paid, for $100. The new 4x booster retails for $125, including shipping and insurance. Gene can be reached at Walnut Creek Arms, 3450 Pleasantville Road, NE, Pleasantville, Ohio 43148 or by phone at (740) 503-4486. His e-mail address is: gdavis10@columbus.rr.com.

A BullzeyePro web site is under construction as this is written. The booster, also known as the Gene Davis Optical Booster, is distributed by Shaw Industries.



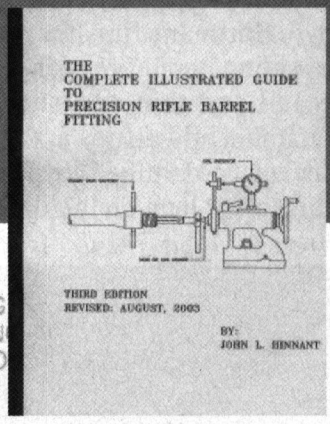
A sleeve of special rubber made to retain its flexibility, strength, and shape, even in wide temperature extremes, holds the 4x lens in place.

Warranted for a lifetime, the 4x booster is shipped in a protective blister package which also contains installation suggestions.

THE COMPLETE ILLUSTRATED GUIDE TO PRECISION RIFLE BARREL FITTING

by John L. Hinnant

Third Edition, Revised August, 2003



This book is the most comprehensive and detailed discourse on the subject of rifle barrel chambering and fitting to date. It contains:

- 304 total 8 1/2 x 11" size pages.
- 146 AutoCAD instructional illustrations.
- Each individual step is fully illustrated with one to four detailed AutoCAD drawings.
- All steps explained in detailed text.
- Twenty (20) AutoCAD drawings for making jigs and tools.
- Thirty five (35) pages of text and fifty one (51) illustrations dedicated to action blueprinting.
- All major aspects of a custom barrel-fitting job are covered; threading, chambering, head spacing, crowning, etc.

The August, 2003 revision added 104 additional pages, 49 new illustrations and 55 pages of new text. All our copies of the new edition are autographed by the author.

I've been fortunate to know John Hinnant for many years and it's no surprise that his book is so effective. He has, after all, just retired from a lifetime of riflesmithing, machining and teaching industrial arts. Growing up in Texas (west of the Pecos) in the '40s and '50s, John had an early interest in firearms and machining processes. These interests remained throughout his life as he taught both to students lucky enough to be enrolled in one of his classes. Dave Manson

ORDER NOW: @ $35.00, plus shipping and handling. Shipping is $3.50 for the first book, $5.00 for multiple book orders-US. Foreign orders (including Canada) will be shipped economy mail unless air is requested and will be charged actual shipping charges plus $1.00 handling. **Order from:** Precision Shooting, 222 McKee Street, Manchester, CT 06040. Phone (860) 645-8776, fax (860) 643-8215. Visa, MasterCard orders accepted without surcharge. CT residents add 6% sales tax; NY residents add 4% sales tax.

A Duffer's Odyssey

BY GEORGE C. STEPHENS

INTRODUCTION

Forty-some years ago, when I was in my late teens and early twenties, I shot each year in my club's Spring High Power League. I remember particularly well one frosty and chilly spring morning just after a good friend of mine, Floyd Hartman, finished his 200 yard sitting, rapid fire string. Floyd was tall and thin and must have been in his mid-fifties at the time. Somewhat painfully, Floyd unfolded his lanky legs on the dew-covered grass and winced a bit as he slowly rose to his feet. He looked at me, a little wistfully, and softly commanded, "George, don't ever get old!" So here I am, just past my 65th birthday and finding it more and more difficult to follow Floyd's long-ago admonition.

But last year, 2007, at Camp Perry, I finally fulfilled a fifty-year old ambition. I competed for the first time in the smallbore three-position (3-P) rifle championship. Fifty years ago I began shooting indoor smallbore rifle with my local Boy Scout troop. This led to shooting indoor 3-P with my high school and college rifle teams. In the early to mid-1960s, I shot repeatedly with the Virginia State High Power Rifle Team and competed with both the M-1 and the M-14 at Camp Perry. Later, working as a field geologist, I lost the opportunity to compete during the summer because of fieldwork in western Canada and elsewhere. I had some truly memorable experiences in some wild and remote parts of the world, but competitive shooting got lost in the progression of my life.

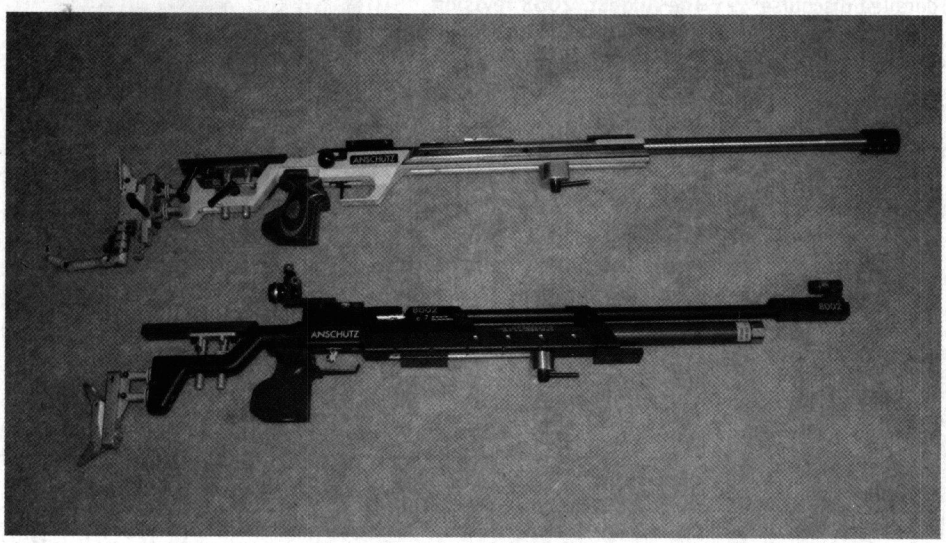


Figure 1. A comparison between my Anschutz 1800-series smallbore rifle (top) with its replacement aluminum stock and the Anschutz 8200 compressed air rifle (bottom).

Fast forward to 1990. I decided to re-enter competitive shooting and began by shooting 50 yard smallbore 3-P at my local gun club. Shortly thereafter I was introduced to the complexities of smallbore prone competition by George Harris, a noted long-time smallbore competitor. Soon I drifted away from position shooting in favor of prone-only competition. I've competed in the Prone Championship at Perry for the last dozen years or so but I've always harbored a desire down through the years to shoot 3-P at the National Championships. In the spring of 2007 I decided that if I ever wanted to do this, sooner was better than later, see paragraph one above, so I

entered both the 3-P and Prone Championships at Camp Perry.

INITIAL TRAINING ATTEMPTS

This meant a concerted effort to relearn how to shoot kneeling and standing. One of my first actions was to bring my kneeling roll out of retirement and to assume the kneeling position in our family room, but with a book or magazine rather than with a rifle. I thought that if I could stay in position for twenty minutes or so I could reacquaint my muscles and tendons with the rigors of kneeling. I did this each night for about a week and for the first few days everything was fine. Then I began to develop a progressively worsening pain at the back of my right knee joint. Within days the pain was so intense that it was impossible to even get into position. So I decided to give this particular aspect of "home training" a rest.

I also broke out an old but accurate Walther LGR side-cocking pneumatic air rifle and sporadically began to shoot standing in the basement. If I shoot caddy-corner from one corner of the basement to another, through the open door of my shop, I have a distance of about 30 feet – three feet less than the regulation distance of ten meters but close enough for practice. My backstop consists of a copier paper cardboard carton filled with newspapers and my illumination source is a halogen shop light. One set of newspapers lasts for a few thousand shots before the repetitive hits progressively drill themselves nearly through the stack.

I had no organized training plan and little thought of any systematic development. On nights when I felt ambitious I shot, on other nights I didn't. As a result my standing scores remained pathetic. Still I somehow deluded myself that I was "in training" for Perry. One night, about three weeks before Perry, as I was cocking the air rifle, it made a strange and expensive sort of popping sound and the cocking lever went slack. Upon disassembly, I found that the aged main seal had completely deteriorated and was lying in pieces in the bottom of the stock. So the Walther was packed off to Pilkington Competition in Tennessee for rebuilding and refurbishment. Thus ended all my ill-fated attempts at pre-Perry home training.

But there was a second part to my "training plan". During the spring and early summer as the weather got nicer, I also began shooting outdoors on the 50 Yard UIT Smallbore Rifle Target, at first only shooting prone and standing. Slowly I was able to begin to shoot kneeling, but only for a very limited time and with much pain. My scores in both standing and kneeling were truly atrocious. I therefore sought solace and guidance from two experienced Camp Perry smallbore veterans, Paul Nordquist and Hap Rocketto (both **PS** staff writers). Paul was ever supportive and encouraging as we practiced together but it was Hap who provided some real insight and solace, via e-mail, when he remarked: "Don't worry, George, it doesn't matter how well you're doing; the wind at Camp Perry will blow you away anyway!" Most years this is surely true, so I soldiered on managing to practice two or three times a week in the summer months preceding Camp Perry.

The good news for me was that kneeling was slowly getting a little easier and less painful. So in early July, fortified with a good lot of Wolf Match Extra ammunition and a large bottle of Ibuprofen I sallied forth to Camp Perry. The best that can be said is that I successfully survived the two days of 3-P competition. My nearest brush with ignominy and utter defeat came on the second day while shooting standing when a wind gust caused me to shoot a perfect center shot on one of the target clips at the edge of the target frame. I was shooting second relay on the same point as my good friend, Jay Sonnenborn, whose clips we were using for the day. Gentleman that he is, Jay never mentioned the now-defunct clip and I sheepishly replaced it with one of my own. My scores for the 3-P aggregate were really mediocre and woefully inadequate but I had a great time and I came away with a resolve to develop a "self-improvement plan" and to shoot 3-P again next year with much improved results.

Continued on next page

A Duffer's Odyssey

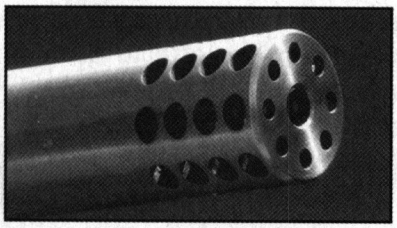
Continued

While walking Commercial Row, I found a new, larger diameter, rubber-chip-filled, kneeling roll to replace my small twenty-year-old, cork-filled veteran. This, quite by accident, turned out to be the key to resolving the pain in my right leg. For reasons completely obscure to me, the larger kneeling roll has largely eliminated my problem. Is it the larger diameter, or maybe the fact that the filling is looser and "surrounds" and cushions the front of my ankle on both sides? I don't know, but I'm now able to assume a reasonably comfortable kneeling position for a half-hour or more and concentrate on refining the stability and balance of my position rather than fighting my previously painful knee joint.

Ron Bartlett's

Vais™ Muzzle Brake

Most muzzle brakes reduce recoil, but none as quietly as the Vais™.



USED BY TOP PROFESSIONALS:
Nesika Bay Precision – McMillan Bros. Rifles
Dakota Arms – Broughton Barrels
Lazzeroni Arms – Gré-Tan Rifles
Bruno Shooters Supply – Krieger Barrels
Hart Rifle Barrels – Pac-Nor Barreling
D&B Supply – Kelbly's Inc. – Bruce Baer

Approved by most professional guides

Available in .17 Cal, to 50 BMG, and diameters from .650" to 1.50". Installed prices start at $225 for stainless or blued. **Dealer pricing** is also available for Vais™ installed brakes, or for brakes only (to be installed by other qualified gunsmiths).

RON BARTLETT
1529 County Road 4513
Hondo, TX 78861
PH/FAX: (830) 741-7167
VAIS ARMS, INC.

DEVELOPING A TRAINING PLAN

A few days after I returned from Camp Perry, my Walther air rifle was returned by Pilkington. They had done an excellent job of repairing and servicing it for a quite reasonable price. With its return, I decided that consistent and systematic training and practice might be the key to improving my standing scores. I resolved to shoot at least twenty shots or more standing every day to see what effect long-term, regularly scheduled training might have. I began on the last day of July and as I write this it is over three months later and I have only missed three days of training.

Another motive for this training regimen is that my son, Chris, began shooting with his high school rifle club last year, coincidentally at the same high school where I shot fifty years ago. First year club members shoot 3-P air rifles at 10 meters, using Feinwerkbau and Anschutz compressed air rifles and, as their performance improves, they move up to become members of the varsity smallbore rifle team. I thought that Chris might join me in standing practice and get a head start on this year's competitive season.

EQUIPMENT FOR 3-P AIR RIFLE TRAINING

My Walther, although superbly accurate, is a real bear to cock and thus is suitable only for standing. Since seeing the compressed air rifles used by the high school rifle team, I was persuaded that this was the way to go. Compressed air technology allows one to shoot prone, kneeling and standing in much the same fashion as smallbore rifle. So in mid-August, I ordered up an Anschutz 8002 CA air rifle from Champion Shooters Supply in New Albany, Ohio. Several highly regarded retailers sell this rifle in the U.S. so my decision was based largely on the comparative prices and on the fact that Carl Joos of Champion Shooters Supply is well known and highly regarded within the smallbore community.

Within a couple days the air rifle arrived and my immediate problems were two: the first was to understand this new and somewhat mysterious technology and the second was to find a source for a compressed air supply tank from which I could fill the rifle's air cylinder. A single filling of this cylinder is good for about three hundred shots. The Anschutz air cylinder is rated at a maximum pressure of 2,900 pounds/square inch (p.s.i.). I made a visit to a local dive shop and learned more about scuba tanks and compressed air than I ever imagined. Compressed air tanks are certified in the U.S. by the Department of Transportation (DOT). Not all foreign-made tanks are DOT certified and if not, cannot be refilled legally. These tanks come in a variety of sizes with the 80 cubic foot size being most common. They are made either of steel or aluminum and are rated for different maximum pressures. The valves on the top of the tanks are removable and of variable quality. It's worth buying both a high quality tank *and* a high quality valve. One also needs a yoke to adapt the air rifle filler valve to most tank valves. After shooting every day for more than two months, about 2,000 rounds total, I had the dive tank refilled for the first time. Its pressure had dropped only from the initial 2,900 psi to about 2,700 psi. In fact the dive shop owner, who gets $5.50 for a tank refill, remarked that I had used so little that the refill was on him!

All tanks must be visually inspected once a year and pressure-tested and recertified every five

years. While these tanks have no legally mandated life-cycle, it is rare to find a tank in service older than twenty years or so. The dive shop owner impressed on me the very real dangers inherent in dealing with these tanks and cylinders. While they are generally robust, they are also easily damaged by dents and scratches, the aluminum tanks especially. If they are damaged or breached, the explosive power of these tanks and cylinders is truly awesome. They should be protected from temperature extremes, especially hot temperatures, and rough handling or falling. The large scuba tanks should either be fastened securely to a wall or stored by laying them on their side in a safe place when not in use.

The Anschutz 8002 is only the third "factory new" rifle that I've ever owned. It's a real gem, with a fully adjustable aluminum "free rifle" style stock and an exquisite two-stage trigger, factory set at a weight of approximately 3 ounces for the first stage and a total weight of about 4.5 ounces. Out of the box the rifle weighs in at about 10.1 pounds. The barrel has an overall length of about 24.5 inches with the last 8.5 inches bored out to a diameter of about 5/8 of an inch to reduce the travel time of the pellet through the rifling. A benefit of the 8002 is that the stock configuration is closely similar to that of my aluminum-stocked Anschutz 1800-series smallbore rifle (Figure 1).

One of the best features of this rifle is that you can cock it by operating the small loading lever located on the right-hand side of the rifle (for a right-handed shooter), set the safety to "safe" and dry-fire the trigger without releasing any air. One may dry-fire in this manner even with a pellet loaded in the chamber. When finished dry-firing, simply re-cock the rifle, flick the safety to fire, and the rifle is ready to discharge. The loading lever is easily switched from the right-hand side of the rifle to the left to accommodate left-handed shooters or those who might wish to load with their left hand while resting the rifle on a standing stand.

With the exception of the pistol grip these rifles are truly ambidextrous and can accommodate both the sinistral and the dextral of our species. The pistol grip is furnished in either right- or left-handed versions with a choice of "medium" or "adult" sizes. The cheek piece, pistol grip and forearm riser block are made of a rough-textured black plastic and are very comfortable. They can be sanded with fine sandpaper if a smoother textured surface is desired. The riser block is attached to the underlying forearm rail by two allen screws. Removal of this block allows the attachment of a conventional handstop to the rail for shooting prone and kneeling.

The 8002 CA is furnished with an instruction book, a set of adjustable barrel and forearm weights, five assorted allen wrenches, riser blocks for both the front and rear sights, adjustable rear butt plate, a small tube of grease, an air cylinder filler adapter and a "bleeder valve" used occasionally to drain the cylinder completely and purge any accumulated water moisture. Although the sight set is not included with the basic rifle, most any Anschutz rear sight is usable, as is any front sight meant to mount on the curved barrel dovetail of most recent vintage Anschutz rifles.

This rifle is superbly accurate right out of the box. In general, pellets come in a choice of two different weights, two or more grades (practice and match) and in some cases in two slightly different diameters. Carl Joos suggested trying the lighter weight pellets, typically thought of as pistol pellets, based on the proposition that a lighter pellet would exit the barrel more quickly. These lightweight, practice grade pellets have a true one-hole capability at 30 feet. I suppose I'll try the heavier rifle pellets next but I can't imagine that,

Continued on next page

PACIFIC TOOL
Chamber Reamers
Bore Reamers
Headspace Gauges
Hand crafted from Carbide & M42 Steel
Many standard and customs in stock for immediate delivery.
1-4 week delivery on wildcats. ***No extra charge on wildcats!***
Don't throw away that Brand X reamer - we will resharpen and install live pilots on any manufacturers reamer.
For assistance on wildcats or special form tools, please call:
Dave Kiff
Ph: 541-826-5808, Fax: 541-826-5304
Or Write:
Pacific Tool, PO Box 2549, White City, OR 97503
www.pacifictoolandgauge.com

A Duffer's Odyssey

Continued

at my level of expertise, I'll detect any difference. Pellet testing is important in air rifles, but mostly only at the level of international competition.

The ten meter air rifle target is challenging. The 10 ring has a diameter of .5 mm, about the size of a small pencil dot and smaller than the head of a pin. Each succeeding ring is about a tenth of an inch in width. Thus the nine-ring has a diameter of about $1/5^{th}$ of an inch, the eight-ring, $2/5^{th}$ of an inch and so forth. The world record for sixty shots standing at ten meters is a perfect 600. (In international competition, the Men's Air Rifle course of fire is sixty shots standing, the Women's course of fire is forty shots standing and the women's record is, likewise, a perfect 400.) One must shoot in the high 590s (or 390s) in order to be competitive at the national or international level. The allowable angular deviation needed to hit a 0.5 mm dot at 10 meters is truly miniscule. The ability of ten meter air rifle champions to shoot one "deep" ten after another is truly awesome. At present, the international community is debating the need to make this target still more challenging!

RESULTS OF SYSTEMATIC TRAINING

Meanwhile back on Earth among us mere mortals, how's it going? As mentioned earlier, I've been conscientious in practicing daily in the standing position. How has this worked out and what have I learned? I keep a daily record of the scores of my ten-shot strings and I also calculate a rolling three-score average of my 20 shot strings. That is each day I average my last three 20-shot scores, adding my latest to the previous two days. This rolling average tends to "smooth out", but not eliminate, the highs and lows and gives me a realistic snapshot of my recent performance. During the initial three-month period, from the beginning of August to the end of October, my average scores improved dramatically, from averages in the 50-60 range out of 100 to an average in the mid- to high-eighties.

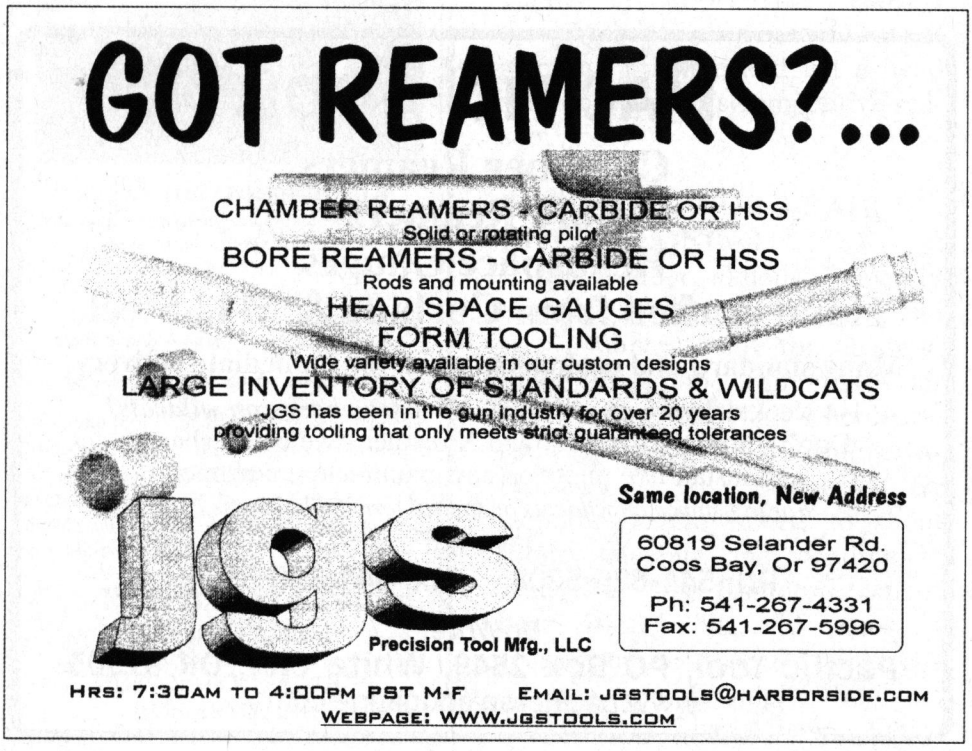
Over this three month period, my standing hold has developed from "non-existent" to modestly stable. I'm still plagued by small and sudden random barrel motions that result in three or four unacceptably wide shots per twenty shot string. I'm at the point where very small and subtle differences in position and technique become increasingly important. My goal for the next four to six months was to improve so as to consistently shoot in the low 180s out of 200. Four months later (end of February 2008) I am still in the high eighties but can't seem to consistently average 90 or better. Time will tell how much additional improvement I can hope to squeeze out of my sixty-plus year old body and nervous system.

To me, the benefits of daily purposeful training are unquestionably valuable. Prior to Camp Perry, I shot 50 yard smallbore 3-P practice an average of three times a week for about six weeks. But this amount of practice was insufficient to make any real improvement. My 50 yard standing scores on the UIT target averaged in the low sixties throughout, about equivalent to my air gun scores at the beginning of my training program. Undirected practice, however serious the intent, three times a week is too infrequent, at least for me, to yield any real improvement.

How time-consuming is my daily practice regime? I leave my target box and standing-stand set up and so I need only hang a target, turn on my shop light, check the pressure level in the air cylinder, put on my coat and boots and begin to shoot. I can shoot a twenty shot string in 15-30 minutes and forty shots in 30-45 minutes.

PHYSICAL TRAINING

Where will I go from here? Well,



there are several possibilities; I have begun a daily regimen of exercise, stretching, push-ups, sit-ups and the like. Surely this is beneficial in a general sense to anyone like me in their mid-sixties or beyond. About a month ago I began doing twenty sit-ups every morning and logging them into my shooting journal so as to provide incentive for doing them regularly. This was a very modest beginning, but I had to start somewhere. After about a week I upped this to twice a day and slowly increased the number of repetitions from 20 to 30, and finally to 35. Recently I've added ten push-ups to each of these sessions. These morning and evening sessions require only about two or three minutes twice a day. Do I now have a washboard stomach and rock-hard abs? Not even close, but after a couple of weeks I began to notice real changes in my muscle tone.

Still missing is a regular program of extended aerobic exercise, running, cycling, swimming or the like. Real benefit from this sort of exercise requires about thirty minutes of vigorous exercise three times a week or so. For me, cycling is probably the best choice but I'm reluctant to add this component until I'm certain that I can commit to it on a regular schedule. Of course, anyone, but especially folks of my age, should check with their doctor before embarking on a program of strenuous exercise.

Flexibility is an issue that I've yet to address. I find I have a limited ability to align my hips in the direction of fire and rotate my torso counterclockwise to align my rifle with the target. I'm still working on proper positioning of my feet and hips so as to bring my natural point of aim onto the target and to provide the proper level of tension in my stomach muscles.

OTHER POSSIBILITIES

A change I made in my practice regimen after about two months was to increase my standing practice from a twenty to a forty shot daily minimum. This is twice as time consuming and while a twenty minute block of time is easy to find at the end of the day, forty minutes is more problematic.

One of my original goals was to undertake a systematic program of kneeling practice. I began by shooting twenty shots kneeling only once a week. More recently, I've begun shooting twenty shots standing and twenty kneeling daily. This has led to improvement in my ability to refine my kneeling position and, in turn, to significant improvement in my scores. But twenty shots daily is not enough to continue to make progress with my standing. My plan for the spring is to increase my training to 40 shots standing and twenty shots kneeling per day. I estimate that this will require about 90 minutes each evening.

Another exercise worthy of exploration is "group shooting" – five shots per bull – concentrating not on score but on progressively shrinking my group sizes and eliminating the very wide shots that still occur more than I would like. One real danger, of course, is over-training and burn out. This is certainly not a problem with shooting only 20-40 shots standing per day. A more ambitious program might well be structured around a five or six day practice schedule per week with a day or two for rest and reflection. As I mentioned, in my first three months of training I only missed three days. The first of these was simply due to burn-out and provided a needed rest. The other two resulted from a severe cold that largely knocked me off my feet for several days. In the subsequent four months I've missed a few more days, some for holiday and business travel, some due to minor illnesses and a couple to pure laziness. Still I've found that heading for my basement range in the evening has become a habit that is readily accommodated.

CONCLUSIONS

What have I learned? My body has developed significant "muscle memory" in the standing position. Additionally I have a more highly developed sense of balance in my feet and legs and I'm developing an appreciation of the requisite levels of tension vs. relaxation in various major muscle groups such as my shoulders, arms and legs.

My intention is to continue this systematic training until the Camp Perry position matches in 2008. My goal is to see just how much improvement a 65-year old can accomplish through a moderate program of regular systematic training and exercise. But regardless of scores, I'm already having boundless amounts of fun, with no worries about ammunition cost or barrel life. In my first six months I've fired about 6,000 shots at a total pellet cost of only about $80.00.

One final note, I highly recommend two books on three-position, international-style shooting: *Ways of the Rifle* (2002) and *Air Rifle Shooting* (2006) both by Heinz Reinkemeier, Gaby Buhlmann, Maik Eckhardt and other contributors. Both of these provide up-to-date information on three-position international style shooting and are available from most commercial vendors of competitive equipment.

VENDORS CITED

Champion Shooters Supply, LLC
P.O. Box 303
42 N. High Street
New Albany, OH 43054-0303
www.championshooters.com
614-855-1603

Pilkington Competition, LLC
P.O. Box 97
#2 Little Trees Ramble
Monteagle, TN 37356-0097
www.pilkguns.com
931-924-3489

TRADING POST

One man's "Junk is another man's "Collectors" Item! Turn your surplus items into cash with a Trading Post ad.

Classified type ads only; **NO display ads. RATES**: .25 cents per word per insertion, **prepaid** by check or credit card. Minimum check charge is $3.00; minimum credit card charge is $5.00. **CLOSING DATES**: Is 40 days prior to the issues cover date. Ads run in the order received. NO refunds issued for canceled ads. **SEND TO**: Precision Shooting, 222 McKee Street, Manchester, CT 06040. NO PHONE ORDERS ACCEPTED.

. . . . . .

WANTED: Unertl scopes 15x to 30x with 2" adjustable AO. Redding 6mm Dasher 3 die set bushing, $50.00. Charlie, 304-768-7460. (5/08, 6/08)

FOR SALE: *Precision Shooting* magazines, Aug. '79 through Sept. '01 (22 years), Aug. '81 missing. 2 issues Aug. '79, Sept. '89, March '98. *Special Editions* No. 1 and No. 3 (2 issues each), total 272 magazines. *Rifle* magazines, May '79 through April '93. *Special Edition* cased set, Vol. 1 and 2. *The Bolt Action*, author Stuart Otteson. Plus shipping. Call, 940-692-2323. E-mail, ruslea44@msn.com. (5/08, 6/08)

FOR SALE: Optical booster for most rifle scopes. Enlarges image in scope 40% and will fit most scopes. http://red40x.spaces.live.com or www.bulzeyepro.com. E-mail, gdavis10@columbus.rr.com. (5/08-7/08)

FOR SALE: Kowa TSN-821 w/27X eyepiece. Creedmoor "Big Blue" complete stand, Creedmoor cases for both. Retail, $1,340.00, sell, $1,000.00. Schneller Range Cart, highly optioned. Retail, $441.00, sell, $300.00. Creedmoor Cordura "Hardback" jacket, size 44, $150.00. All items used for only one season, all in excellent condition. Shipping will be quoted. Call Steve, 510-594-1873.

WANTED: 30-40 Ackley Improved dies. Tim Crawford, 406-388-4211.

SCOPES WANTED: USMC marked Unertl – Unertl's – Lyman's – Fecker's – Redfield 3200 or other target scopes. **BUY, SELL, OR TRADE**. Call Dewy at 320-795-2930 or check my website at www.unertlscopes.com. (1/08-12/08)

ACCURIZE
Rifle Scope Installations with our PATENTED Scope Ring Alignment System / Lapping Kits.
EASY TO USE KITS *always give a perfect fit.*
KOKOPELLI PRODUCTS
3820 FOOTHILL ROAD • KALISPELL, MT 59901
406-755-3220 • www.kokopell.com

GMW-VICKERMAN
STRAIGHT LINE BULLET SEATING DIE
ACCURACY TO WITHIN .001"
509-382-4159
WWW.GMWVICKERMAN.COM
GMW, PO Box 25, Dayton, WA 99328

LAWTON MACHINE

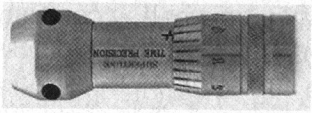
·BENCHREST ACTIONS
·MATCH-GRADE BARRELS
580 1/2 N. Montana St.
Dillon, MT 59725
406-683-2388
www.lawtonriflebarrels.com

STEVENS ACCURACY • 895 County Rd 200 Brundidge, AL 36010 (334) 735-2261
COL Billy Stevens, USA (RET)
WORLD CLASS CUSTOM RIFLES
Benchrest – Varmint – Big Game
FULL-TIME PRECISION GUNSMITHING
Chambering – Actions – Trued
Pillar/Glass – Bedding – Barrel Fluting

The Shooters' Corner, Inc.
8 New Jersey Ave, Lake Hopatcong, NJ 07849
(973) 663-5159
- We pay TOP DOLLAR for used benchrest, 40X and varmint hunting rifles and equipment and estates.
- Largest inventory of USED benchrest rifles and equipment in USA.
- Large inventory of USED varmint hunting rifles factory and custom.
- Check out our current inventory on our website or call for recent acquisitions.
- We also stock a wide variety of BR loading equipment, pedestals, and scopes.
- **Precision Benchrest/Varmint bolt action gunsmithing by Bob White.**

Email: shootcnr@optonline.net or visit us on the web at benchrest.com/shooterscorner

RIFLES BUILT
Benchrest, Varmint, Sporter, National Match, Palma, Long Range, Service Rifles
Chambering-Octagons-Fluting-Actions Trued-Special Machining
Benchrest techniques incorporated into every rifle.
Westwind Rifles Inc.
P.O. Box 261
640 Briggs St.
Erie, Colo. 80516
(303) 828-3823
David S. Sullivan - Gunsmith

SUPERTUNE IMPROVES ACCURACY

- Achieves the tightest groups possible
- Harmonically balances barrel to a chosen lot of ammo

PRECISION GUNSMITHING
TIME PRECISION 860-350-8343
4 Nicholas Square, New Milford, CT 06776
timeprecision@aol.com **NBRSA LEGAL**

D C G BULLETS
I have been making 6mm – 66 grain Bench rest bullets for the past 30 years. They are precisely made by hand and are very accurate. These bullets shoot very small groups. Try a few hundred you will be *happy* you did. $23.00 per hundred plus shipping and handling. Please contact me at (201) 489-0069, ask for Dominick.
Satisfaction guaranteed.

360° REVOLVING SHOOTING TABLE "VARMINT HUNTER'S DELIGHT"
Four years in development. 100% field tested. Revolves 360° on machined, fitted steel post with brass bearing.
3/4" plywood top and built-in, fully adjustable seat. 32"x40" dual table, left and right hand shooters.
Total take-down, two minutes, no tools, all wing nuts, and snap pins. Primer painted. Portable. Stable. Available as complete unit or as kit without wood.
Complete Unit, $269.00 plus UPS shipping 120 lbs. Kit without wood $219.00 plus UPS shipping 50 lbs. (Obtain shipping charge from UPS and include with price. Master, Visa or MO)
BJ ENTERPRISES
385 FENWAY PL., BARTLESVILLE, OK 74006
Telephone 1-918-333-5276
RHJMLJ@SBCGLOBAL.NET

OPTICAL SERVICES CO.
CUSTOM POWER INCREASE (+60%) FOR MOST TARGET SCOPES, B&L BUSHNELL, LEUPOLD, LYMAN AA, LYMAN STS, REDFIELD 3200 & 6400, SIGHTRON, UNERTL, WEAVER T, STEEL T SERIES, REBUILD AND BLUEPRINT BENCHREST & VARMINT BULLET DROP RETICLES
BILL ACKERMAN
P.O. Box 1174
Santa Teresa, NM 88008
(575) 589-3833
e-mail:oscscope@aol.com

BARREL FLUTING
Increase Cooling
Reduce Weight
Will Not Affect Accuracy
Adds A Distinct Look
Tel: (570) 992-4499 Fax: (570) 992-4303
RR4 Box 4168 Gumm St, Stroudsburg, PA 18360

CCG Firearms — Custom Target Rifles
Rebarreling, Actions Trued, Custom Laminated Walnut/Maple stocks, Pillar glass bedding
5217 E. Belknap St, Haltom City, TX 76117
PH: 817-834-9554 (days) 817-232-5477 (night)
Visit our web site: ccgfirearms.com

www.Corbins.com
Your hobby can pay for itself!
Custom bullet swaging is fast, safe, and it can be very profitable: *See how!*
Ph. 541-826-5211 Fax 541-826-8669

Brux Barrels
Precision Single Point Cut Rifle
Target—Varmint—Hunting
- Precision Match Grade Barrels
- Double Hand Lapped
- 416R Stainless Steel 240.00
- 4150 Chromemoly 200.00
- Avail. Cal. 30 Cal.7mm 6.5mm
- 6mm 22CF 22RF

For more info. Call 608-592-3324
Brux Barrels
917 Development Dr.
Lodi, Wisconsin 53555

BAT Machine Co., Inc.
11550 N. Bruss Rd
Rathdrum, ID 83858
(208) 687-0341
Buy the best and cry once!
Fine custom actions & complete rifles.
Action sizes to suit all classes of BR, varmint and long range hunting.
www.batmachine.com

JEWELL TRIGGERS
MATCH GRADE STAINLESS TRIGGERS FOR:
CUSTOM BENCHREST ACTIONS
REMINGTON 700, 40X, ETC.
MODEL 70 WINCHESTER
AR-15
PULL RANGES FROM 1.5 OZ. TO 4 LB.
OPTIONS AVAILABLE:
SAFETY TOP OR BOTTOM, LEFT OR RIGHT
BOLT RELEASE LEVER, LEFT OR RIGHT
3620 N. State Highway 123
San Marcos, TX 78666
(512) 353-2999

FLASH EBERT
TURBO MK1
22 RIMFIRE ACTIONS SS
R/B L/P ❖ R/B R/P
5904 Montana, Odessa, TX 79762
432-664-1120 • 432-366-6063

CROSS DOMINANT? TIRED OF SQUINTING?
LOOKING FOR THAT EXTRA ADVANTAGE?
THE **EYEBLIND** IS WHAT YOU'RE LOOKING FOR!
★ GUARANTEED QUALITY
★ PATENTED
★ AVAILABLE IN BLACK OR SEMI-TRANSPARENT SMOKE
★ FOLDS BACK WHEN NOT IN USE
★ DEALER PRICES AVAILABLE
CALL TO ORDER: **509-453-7751** or www.eyeblindllc.com

JARD, Inc.
Remington 700 Trigger Kit
Remington 700 Trigger Kit:
- Inexpensive
- Uses Factory Housing, Adjusting Screws, and Safety
- More Reliable than a Four Lever System
- Lighter Trigger pull

2737 Nettle Ave.
Sheldon, IA 51201
PH. 712-324-7409
E-mail: jardinc@excite.com
www.jardinc.com

Bull Mountain Rifle Co.
Custom Rifles • Custom Stocks
Target Rifles
► BENCHREST QUALITY ◄
Building, Live Varmint, Sporter, and Light Magnum Rifles.
Bedding • Custom Trigger Work
Muzzle Breaks
Call Mon-Fri (RMT)
Anytime
(406) 656-0778
Randy Melvin, Prop.
6327 Golden West Terrace
Billings, MT 59106

OUTDOORSMAN, INC
RD 1, Box 228, Kingsley, PA 18826
PH 570-222-3390; Fax 570-222-3395
M, T, TH, F 10-5, Sat. 10-3
Shooting Accessories & Guns for the Serious Varmint Target Shooter
SPECIALITY ITEMS
Fine Rifles from Cooper Arms, Dakota, Cascade Arms & Calhoon. Specialty guns and accessories for varmint hunting and accurate 22 LR's.
AVAILABLE
Cooper's Model 57M in 22 LR, 22 Mag, 17 HMR and 17 MACH II. Cooper Varminters in most calibers as well as some higher grade rifles. Casade Rifles in many calibers. Dakota Varmint Rifles and Sporters in many calibers. Calhoon Rifles in 19 Calhoon and 19-223.
Contact Tom, Lloyd or Joanne
email: outman66@yahoo.com

Air Density Meter
for benchrest shooters
$249. - post paid
www.AirDensityMeter.com
936-295-2848
James Cockrell
P.O. Box 488
New Waverly, TX 77358
Made in the U.S.A.
Lifetime Calibration Warranty

Complimentary Copies of Precision Shooting
We're always willing to send a complimentary copy of PS anywhere in the US or Canada.
Simply call us at
(860) 645-8776
and give us the name and address the magazine should be sent to.

IBS News

2008

IBS CHAMPIONSHIP MATCHES

Group Nationals	Kelbly's Range, OH	Aug 11-16
200/300 Group Nationals	Union County, PA	Oct 4-5
Score Nationals	Chippewa, Easton, OH	Sept 13-14
200/300 Score Nationals	Thurmont, MD	July 19-20
600 Yard Nationals	Oak Ridge, TN	June 26-28
1000 Yard Nationals	Ohio 100 Yard Club	Aug 29-31

2008 IBS 100/200 YD SCORE NATIONALS

SEPTEMBER 13, 2008 9:00 A.M. – 100 yards
SEPTEMBER 14, 2008 8:00 A.M. – 200 yards

CHIPPEWA RIFLE CLUB

Located on State Route 585 at Chippewa Creek
Easton, Ohio

Hunter, Varmint Hunter, VFS, Junior
2 gun 6X & VFS Trophies
Registration - $64 per gun w/$10 late fee after August 13

Contacts: Randy Perkowski
1259 Curtis Avenue
Cuyahoga Falls, Ohio 44221
330-928-9430
Perkosrk@sbcglobal.net

Ken Gaskins
9125 Lake in the Woods
Chagrin Falls, Ohio 44073
440-543-7971
kens6ppc@windstream.net

Breakfast and lunch will be available Saturday and Sunday.
See the IBS website under ranges for more information and a map.

DUNHAMS BAY

The March 2nd match of the Bay's winter league found eighteen hardy souls on the firing line. Top guns for the day were: 1) Jim Griffin .2250, 2) Bob Griffin .2686, 3) Allie Euber .2724, 4) Scott Miller .3068, 5) Roscoe Murray .3220.

The March 16th match of the Bay's winter league had nineteen hardy souls on the firing line (presumably the eighteen from the above match plus one more shooter who must have concluded that Spring was on the way and maybe it was now safe to venture forth. Top shooters: 1) Russell Rains .2098, 2) Tom Svack .2326, 3) Allie Euber .2612, 4) Ken Hope .2864, 5) Lee Euber.2920.

2008 DUNHAMS BAY WINTER LEAGUE SEASON AGGREGATES

1) Allie Euber .2596, 2) Bob Griffin .2705, 3) Jim Griffin .2847, 4) Lee Euber .2869, 5) Ken Hope .2940.

NAME	CAL	ACTION	BARREL	GUNSMITH	STOCKER	SCOPE	POWDER	CASE	BULLET	PRIMER
RUSSELL RAINS	6PPC	PANDA	HART	DOWLING	MCMILLAN	TASCO-36	N133-29.4	LAPUA	BARTS H/H	205
TOM SVACK	6PPC	CPS	HART	MASKER	NA	LEU-36	N133-29.6	SAKO	EUBER-68	205M
ALLIE EUBER	6PPC	VIPER	HART	LACHAPELLE	BRUNO	LEU-36	N133-29.8	LAPUA	EUBER-68	205
KEN HOPE	6PPC	BORDEN	HART	BORDEN	ROBERTSON	SIGH-36	N133-28.9	LAPUA	EUBER-68	205M
LEE EUBER	6PPC	FARLEY	KRIEGER	LACHAPELLE	BORDEN	LEU-36	N133-30	LAPUA	EUBER-68	205
BOB GRIFFIN	6PPC	BAT	KRIEGER	GOODLING	LARSON	LEU-36	N133	LAPUA	EUBER-66	205
RICHARD JOHNSON	6PPC	TEDDY	SHILEN	LACHAPELLE	MCMILLAN	WEA-36	N133-28.3	LAPUA	EUBER-66	205M
SCOTT MILLER	22/100	PANDA	LILJA	LACHAPELLE	SPEEDY	LEU-35	BALL-C	LAPUA	EUBER-52	205
THOMAS SAFFORD	6PPC	PANDA	HART	LACHAPELLE	MCMILLAN	LEU-36	N133-29.5	LAPUA	EUBER-66	205
ROSCOE MURRAY	6PPC	HALL-B	KRIEGER	HOLLISTER	MCMILLAN	WEA-36	8208-29.5	SAKO	EUBER-68	205M

NAME	CAL.	ACTION	BARREL	GUNSMITH	STOCKER	SCOPE	CASE	POWDER	LOAD	BULLET	PRIMER
JIM GRIFFIN	6PPC	NESIKA	HART	LACHAPELLE	SPEEDY	LEU-36	LAPUA	N133	NA	EUBER-66	205M
BOB GRIFFIN	6PPC	BAT	KRIEGER	GOODLING	LARSON	LEU-36	LAPUA	N133	NA	EUBER-66	205M
ALLIE EUBER	6PPC	HALL-B	SHILEN	CRAWFORD	BORDEN	LEU-36	LAPUA	N133	29.8	EUBER-68	205
SCOTT MILLER	22-100	PANDA	LILJA	LACHAPELLE	SPEEDY	LEU-35	LAPUA	N133	26	EUBER-52	205
ROSCOE MURRAY	6PPC	HALL-B	KRIEGER	HOLLISTER	MCMILLAN	WEA-36	SAKO	8208	29.5	EUBER-68	205M
LEE EUBER	6PPC	FARLEY	KRIEGER	LACHAPELLE	BORDEN	LEU-36	LAPUA	N133	30	EUBER-68	205
DICK JOHNSON	6PPC	TEDDY	SHILEN	LACHAPELLE	MCMILLAN	WEA-36	LAPUA	N133	28.3	EUBER-66	205M
HAROLD MILLER	6PPC	VIPER-DP	HART	LACHAPELLE	BORDEN	LEU-36	LAPUA	N133	28.9	EUBER-66	205M
KEN HOPE	6PPC	BORDEN	HART	BORDEN	ROBERTSON	SIGH-36	LAPUA	N133	28.9	EUBER-68	205M
WYATT FOX	6PPC	TEDDY	HART	NA	MCMILLAN	LEU-36	LAPUA	H322	29	EUBER-66	205

FAIRFAX

The conditions at Fairfax today (March 22nd) were nasty. At least that was the Polite Company term for them. The warmup was pretty good but by match 1 there was a hard push with fast switches and letups and just a general mess with flags pointing in all directions. (Editor: And you kept on *shooting*?) By match 3 the intensity had dropped off some but the switches and mixed up mess were still hanging around, but by then almost everyone had been roughed up pretty bad. Dick Spencer was the last man standing with a 249-8x score; Dick dropped a point on his very last shot. (Editor: That should have sent him home in a happy mood…) Hal Drake was second with a 249-6x score and he was also third with a 248-10x. Henry Vranian was 4th with a 248-8x and Jack Cox was fifth with a 247-7x.

Modified Factory class: 1) Adrian Van Gorder 239-3x, 2) DougMerold 233-0x.

DAMARISCOTTA

On April 13, Lincoln County (Maine) held a 100 yard match. After a long, long. long winter the Maine season started with a bang (pun intended.) With a 30% chance of rain looming in the forecast, the day came and went without a drop. (Editor: our Connecticut weather forecasters also do that a lot.) Everyone seemed to be struggling with the breezy conditions, new barrels and loads. All, that is, except Frank Danisienka! He shot in mid-season form and far outclassed the field of 11 by taking the VFS honors with a 250-21x. Frank has sent the message and it may be a long, long, long summer if we don't compete better than we did on Sunday. For second place Jim Goody Creedmoored Greg Palman, both with scores of 250-16x.

Orland Bunker bested the three person field in the Hunter class by out X-ing the Hills brothers. Orland had 13 Xs to go with his 247 score while Peter had 9 and Parker 5.

The Hills also battled it out for the Varmint Hunter class with Parker coming out ahead with a 248-9x while Peter had a 247-8x score.

Scott Garman in his first shoot had a very respectable score of 244-4x.

Match report by Randy Jarvais.

GALLATIN

The Gallatin (Tennessee) Gun Club hosted 21 shooters on April 5th for a 100-200 yard VFS match at their home range. The Club's match report does not give range aggregates nor placings for the shooters, so we'll just do the best that we can with the report received.

At 100 yards: 1) Jackie Stogsdill 250-22x, 2) Bob Poindexter 250-20x, 3) Danny Hensley 250-20x, 4) Greg Yanders 250-17x, 5) Mike Ezell 250-17x.

At 200 yards: 1) Bob Poindexter 250-11x, 2) Greg Yanders 250-11x, 3) Mike Ezell 250-10x, 4) Jackie Stogsdill 250-8x, 5) Tommy Long 250-6x.

Grand Aggregate (and this category is in correct order): 1) Bob Poindexter 500-31x, 2) Jackie Stogsdill 500-30x, 3) Greg Yanders 500-28x, 4) Mike Ezell 500-27x, 3) Danny Hensley 500-26x.

Gallatin Gun Club

IBS Score Match	100/200												
April 5 2008	Equipment (Drop Down Boxes)												
Competitors	Bench	Class	Caliber	Action	Barrel	Stock	Gunsmith	Scope	Power	Powder	Bullet	Wgt	Primer
Bob Poindexter	211	VFS	30BR	Stiller	Broughton	Kelbly	Stogsdill	NightForce	12-42X	H4198	Euber	118	Fed
Jackie Stogsdill	111	VFS	30BR	Stolle	Kostyshyn	Kelbly	Self	NightForce	12-42X	H4198	Stogsdil	115	WSR
Greg Yanders	116	VFS	30BR	Stolle	Lilja	Kelbly	Stogsdill	NightForce	12-42X	H4198	Stogsdil	115	Fed 205
Mike Ezell	103	VFS	30Maj	Stolle	Lilja	McMillan	Self	Weaver	36x	H4198	Own	112	Fed 205m
Danny Hensley	106	VFS	30BR	Stolle	Kostyshyn	Robertson	Stogsdill	NightForce	12-42X	H4198	Stogsdil	115	Fed 205
Tommy Long	105	VFS	30BR	Borden	N/A	Borden	Rivers	Weaver	36x	H4198	Bib	117	Fed
Lee Bullock	112	VFS	30BR	Stolle	Lilja	Kelbly	Stogsdill	Weaver	36x	H4198	Stogsdil	115	WSR
John Stone	108	VFS	30BR	Stiller	Kostyshyn	Speedy	Stogsdill	NightForce	12-42X	H4198	Fowler	117	Fed 205
Dan Honert	104	VFS	6mm	Bat	Krieger	Scoville	Scott	Weaver	36x	N133	^	N/A	Fed 205
Randy Dawson	201	VFS	30BR	Rimrock	Kostyshyn	Borden	Borden	Leupold	45x	H4198	Stogsdil	115	CCI BR4
John Beauchamp	102	VFS	30BR	Stiller	Rock Creek	Borden	Stogsdill	NightForce	12-42X	H4198	Own	112	WSR
Paul Money	209	VFS	30BR	Rem	Krieger	McMillan	Dowling	Weaver	36x	H4198	Euber	115	Fed 205
Ron Jackson	113	VFS	30BR	Stolle	Kostyshyn	McMillan	N/A	NightForce	12-42X	H4198	Stogsdil	115	Fed 205m
John Bruhn	205	VFS	30BR	^	N/A	N/A	Rivers	March		H4198	Bib	118	Fed
Jim Harris	101	VFS	30BR	Nesika	Hart	McMillan	Dowling	NightForce	12-42X	H4198	Bib	118	Fed 205m
Jerry Nettles	107	VFS	30BR	Borden	Hart	Borden	Stogsdill	Leupold	45x	H4198	Stogsdil	115	Win
David Stubblefield	110	VFS	30BR	Stolle	Krieger	McMillan	Stogsdill	NightForce	12-42X	H4198	Stogsdil	115	Fed 205m
Mitch Newman	109	VFS	30BR	Rem 40X	Lilja	McMillan	Self	Leupold	45x	H4198	Euber	120	Fed
Shawn Harris	206	VFS	30BR	Stolle	Rock Creek	Robertson	Stogsdill	Leupold	45x	H4198	Berger	110	Fed 205m
Joe Jarrell	114	VFS	30BR	Stolle	Rock Creek	Shehane	Stogsdill	Weaver	36x	H4198	Stogsdil	118	WSR
Rick Fox	215	VFS	30BR	Stolle	Krieger	N/A	Stogsdill	Leupold	40x	H4198	MJR	112	CCI BR4

BOWMANSTOWN

A 100 yard match for the three Score classes at the Bowmanstown range on April 13th
Hunter class: 1) Gary Long 249-10x, 2) Vince Pastorella 248-10x, 3) Terry Reese 248-9x.
Varmint Hunter class: 1) Ina Reese 243-5x.
Varmint For Score class: 1) Joe Pellegrene 250-22x, 2) Mark Ludinsky 250-21x, 3) Ken Livengood 250-20x, 4) Ricky Read 250-18x, 5) Dale Hanselman 250-18x.

LAKELAND

A 100 yard VFS match at the Florida range on April 5th, with five competitors. 1) Terry Flynn 250-21x, 2) David Carpenter 250-21x, 3) Esten Spears 250-15x.

BLACK CREEK

April 5th was a good day for a score match. The weather was mild with a drizzle rain for the most part of the day. Conditions were such that you could shoot the first two targets without holding off more than a small amount but as the day progressed for some of your shots you were holding off quite a bit. (Editor: the best remark along this line that I ever heard was at some match where the wind really howled and some shooter, at the end of his relay was asked where he had been holding for his final shot. "To tell the truth I was holding on the picture window of the clubhouse…and praying that there wouldn't be a sudden letup just as I squeezed off the shot.")

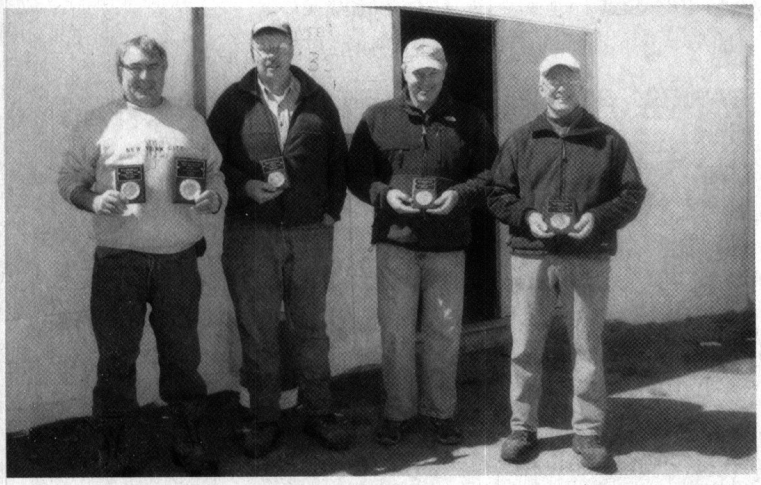
There were 24 shooters, broken down in heavy and light classes. Overall (combined) class: 1) Mike Ryan 250-23x, 2) K.C. Young 250-22x, 3) Hal Drake 250-21x, 4) Steve Stanley 250-21x, 5) Adrian Van Gorder 250-21x (also the winner of the light gun division.)

2007-2008 CAMILLUS WINTER LEAGUE

The Camillus Sportsmens Club hosted their usual winter league once again for the 2007-2008 season. The Camillus match bulletin assures us (with a straight face) that "We had reasonable weather for most of the matches this winter"…a statement you can either accept at face value…or laugh aloud. Historically some of the Camillus winter league matches have been fired in weather conditions that no intelligent polar bear would have ventured outside in. So we shall give the Camillus gang a certain amount of poetic license while idly wondering how many bodies are still buried in snow drifts out there on the club range. The amazing part is, in years past when a body was discovered in the spring, once taken into the clubhouse and thawed out…they were pretty much as good as new and seemed interested primarily in when the first summer match would be held.

Score matches (three) standings: 1) Mike Mastrogiovanni 500-37x, 2) Ken Frehm 500-36x, 3T) Bill Parfitt 500-27x, 3T) Jim Kusche 500-27x, 5) Bob Kontak 499-29x.

Group matches (seven) standings: 1) Ron Blatt .2862, 2) Bill Parfitt .2979, 3) Jim Kusche .3111, 4) M. Mastrogiovanni .3126, 5) Tim Simbari .3136.



Left to right: Mike Mastrogiovanni (first in score, fourth in group,) Bill Parfitt (second in group,) Tim Simbari (fifth in group,) Ron Blatt (first in group.) Not pictured is Jim Kusche (third in group.)

FAIRFAX

The last match of the 2007 year was held on December 30th. There was a light turnout, what with the threat of bad weather keeping a lot of the regulars away. In addition this was a 200 yard VFS match and 200 yard matches don't give one the degree of satisfaction to be had from running one's x-count up into the twenties and feeling good about yourself for the duration of your drive home (at least.) The weather was rather chilly and got colder as the match progressed. Around noon it was down to around 40 degrees. The wind was tricky but mostly manageable, but at the end of the day just six shooters were able to hold on to the elusive 250. Congratulations to Julia on her first win!

Varmint For Score class (15 shooters): Julia Van Gorder 250-12x, 2) Dick Grosbier 250-9x, 3) Dean Breeden 250-8x, 4) Adrian Van Gorder 250-8x, 5) Hal Drake 250-5x.

Factory class (2 shooters): 1) Adrian Van Gorder 239-3x, 2) Ray Bowman 239-2x.

FAIRFAX

The first match of 2008 was held on January 13th, with 18 shooters for the 100 yard VFS match and most unusually there were a number of shooters for the Factory class…four shooters in Factory class (a number of them being new shooters) and four more in Modified Factory class (two new shooters and two experienced shooters.) Only six shooters stayed clean. Curtis Tripp won the VFS class with an impressive 250-12x, after starting off with an eye-blinking 50-5x on his first target, which served notice to the other shooters that he was serious about shooting today. Julia Van Gorder continued her recent hot shooting; winner of the previous match and second today.

Varmint For Score class: 1) Curtis Tripp 250-12x, 2) Julia Van Gorder 250-10x, 3) Gerald Reisdorff 250-9x, 4) Kay Young 250-9x, 5) Mike Morgan 250-9x.

Factory class: 1) Christopher Romero 176-0x, 2) Matthew Torres 52-0x, 3) John Refferty 43-0x.

Modified Factory class: 1) Adrian Van Gorder 244-6x, 2) Ray Bowman 230-2x, 3) Branden Bailey 163-0x, 4) Brad Kim 130-0x.

	Name	ACTION	CAL	BARREL	SMITH	STOCKER	Wt	LP	BMAKE	PRIMEF
JULIA	VAN GORDER	Panda	30BR	Hart	Shaw	Borden	0.0	4198	Berger	205M
DICK	GROSBIER	Hart	30BR		Self	McMillan	35.7	4198	BIB	Rem
DEAN	BREEDEN	BAT	30RCH	Rock Creek	Goodling	Goodling	0.0		Euber	205
ADRIAN	VAN GORDER	Viper	30JR		Reisdorff	Borden	0.0			WSR
HAL	DRAKE	BAT	30BR	Bartlein	Self	Edge	35.0		Tenx	205
DON	JONES	Farley	6PPC		DJ	DJ	30.0	8208	DJ	205
WAYNE	SHAW	BAT	30WW	Shilen	Self	BRX	0.0	4198	Saubier	Win
ROBERT	LLEWELLYN	Stolle	30BR	Rock Creek	Green		33.0	4198	Fowler	205M
GERALD	REISDORFF	Nesika	30JR		Self		0.0			
GERALD	REISDORFF	Nesika	30BR	Kreiger	Self		0.0			

FNAME	LNAME	ACTION	CAL	BARREL	SMITH	STOCKER	SCOPE	Bullet
Curtis	TRIPP	REM700	30BR	Hart	Young	McMillan	Leupold	Euber
JULIA	VAN GORDER (R)	Panda	30BR	Hart	Shaw	Borden	Weaver	Berger
GERALD	REISDORFF (R)	Nesika	30BR	Hart	Stevens	McMillan	Leupold	Fowler
KAY C	YOUNG	TPE	30	Kreiger	Shaw	Shaw	NF	Berger
Mike	MORGAN (R)	Nesika	30BR	Brux	Self		Leupold	
MAURICE	BANDY	Hall	30	Hart	Spencer	McMillan	Leupold	Fowler
DEAN	BREEDEN	Farley	30MADDOG	Barlein	Goodling	Goodling	NF	Saubier
DAVID	APPLE	BAT	30BR		Goodling	Goodling	Leupold	10X
DON	JONES	Farley	6PPC	Kreiger	DJ	DJ	B&L	DJ
DICK	GROSBIER	BAT	30BR	Rock Creek	Self	McMillan	NF	Fowler

MINNESOTA 1000 YARD IBS STATE CHAMPIONSHIP

July 7th & 8th, 2007 was very HOT in MN in both temp and good shooting.

Shawn Koop started the match by shooting a state record of 3.631" LG state record off a bipod for his first ever match shot. Only to be out done by Donovan Moran in the same relay with a 3.261" LG group in MATCH 5.

In MATCH 7 Donovan Moran backed up the previous days groups with a 2.993" 50-2x. All with his 6Dasher after driving home to North Dakota to load more shells for the Sunday match. A very good friend named Dick (his gunsmith) picked him up at 2:30 AM and drove him back to the match on Sunday so he could sleep on the road trip back. Donovan forgot that it was a two day match and only loaded shells for one day. NOW that is a real DRIVE to WIN a match and the state championship…Congrats Donovan.

Other great shooting:

Richard Nelson	LG	5.509"/49-3x
Jay Cutright	HG	7.210"/99-4x

Great shooting and very hot days was had by all!!! Thanks Guys!!!
…Dave Holland (Match Director)

	MATCH 5	
LG Group	Donovan Moran	4.256"/49-1x
LG Score	Heath Cram	12.164"/41
HG Group	Richard Nelson	10.493"/71
HG Score	Jay Cutright	10.158"/69
	MATCH 6	
LG Group	Jay Cutright	6.993"/47-1x
LG Score	Jared Flynn	14.599"/38
HG Group	Jay Cutright	9.722"/95-2x
HG Score	Richard Nelson	9.961"/89-1x
	MATCH 7	
LG Group	Richard Nelson	4.966"/44
LG Score	Greg Wahlstrom	14.271"/44
HG Group	Donovan Moran	11.721"/88
HG Score	Richard Nelson	7.097"/88
	MATCH 8	
LG Group	Richard Nelson	7.144"/47
LG Score	Greg Wahlstrom	11.328"/46
HG Group	Donovan Moran	9.407"/77
HG Score	Heath Cram	19.810"/85

STATE CHAMPION WAS DETERMINED BY THE SMALLEST GROUPS IN ALL 8 MATCHES

1st Place	56.285" average of 7.035" was shot by Donovan Moran
2nd Place	74.214" average of 9.276" was shot by Jay Cutright
3rd Place	76.566" average of 9.570" was shot by Richard Nelson
4th Place	101.056" average of 12.632" was shot by Bill Behnke
5th Place	106.002" average of 13.375" was shot by Dave Holland

LG Overall Group Winner	Richard Nelson
LG Overall Score Winner	Greg Wahlstom
HG Overall Group Winner	Donovan Moran
HG Overall Score Winner	Richard Nelson

LAKELAND

Five shooters contested a 100 yard VFS match at the Lakeland, Florida range on March 1st. Top shooters at day's end: 1) Esten Spear 250-19x, 2) Terry Flynn 250-17x, 3) Paul Thielen 244-7x.

FAIRFAX

A 200 yard VFS match on February 17th with quickly changing wind conditions kept every one of the 22 VFS shooters from turning in a clean score. Yes, if there is one thing more humbling than a 200 yard match in such conditions…it's a 300 yard match. Fortunately for all of us there are no 400 yard matches…yet. Top five guns for the class: 1) Mike Morgan 249-7x, 2) Dick Powers 249-6x, 3) Curtis Tripp 249-3x, 4) David Apple 248-9x, 5) Kay C. Young 248-9x.

100 yard Modified Factory class (3 shooters): 1) Ray Bowman 242-3x, 2) Adrian Van Gorder 241-2x, 3) Doug Merold 237-1x.

100 yard Factory class (3 shooters) 1) Michael McLaughlin 214-0x, 2) Rudy Reyes 204-1x, 3) Christopher Romeo 6-0x.

Equipment List

FNAME	LNAME	ACTION	CAL	BARREL	SMITH	STOCKER	SCOPE	P	Wt	Pow	Bullet	Wt
Mike	MORGAN	TPE	30BR	Kreiger	Shaw	Shaw	NF	42	0.0	4198	Berger	110
Dick	POWERS	Stolle	30BR	Kost	Jones	Jones	Weaver	36	35.1	4198	Fowler	117
Curtis	TRIPP	REM700	30BR	Hart	Young	MacMillan	Leupold	45	33.5	4198	Euber	118
DAVID	APPLE	Farley	30MD	Bartlien	Goodling	Goodling	NF	42	0.0		Saubier	0
KAY C	YOUNG	Nesika	30BR	Hart	Stevens	MacMillan	Leupold	40	33.5	4198	Fowler	118
Lynn	SHAW	Farley	30WW	Kreiger	Shaw	Edge	NF	42	0.0	4198	10X	0
ADRIAN	VAN GORDER	Panda	30BR	Hart	Shaw	Borden	Weaver	36	0.0	4198	10X	117
WAYNE	SHAW	BAT	6.5WW	Kreiger	Shaw	BRX	NF	42	0.0	2015	GTB	0
RICHARD	SPENCER	BAT	30BR	Bartlein	Goodling	Goodling	NF	42	39.5	4198	Fowler	115
HAL	DRAKE (R)	REM	30PPC	Kreiger	Self	McMillian	Sightron	36	32.3	RE7	10X	115

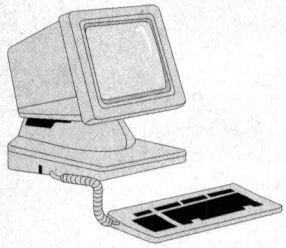
DUNHAMS BAY

A Heavy Varmint class match on January 13th at the Bay's range, contested at 100 yards with 21 shooters on the firing line. Top guns for the day: 1) Bob Griffin .2622, 2) Allie Euber .2682, 3) Tom Svack .2800, 4) Scott Miller .2902, 5) Russell Rains .2964.

Another 100 yard HV match at the Bay a mere week later, on January 20th. Top guns: 1) Jim Griffin .2802, 2) Allie Euber .2822, 3) Lee Euber .2920, 4) Bob Griffin .2982, 5) Ken Hope .3038.

Well, why not another 100 yard HV match, again a mere week later, on January 27th? Top guns: 1) Allie Euber .2366, 2) Lee Euber .2410, 3) Bob Griffin .2530, 4) Ken Hope .2750, 5) Jim Griffin .2826.

NAME	CAL	ACTION	BARREL	GUNSMITH	STOCKER	SCOPE	POWDER	CASE	BULLET	PRIMER
JIM GRIFFIN	6PPC	NESIKA	HART	LACHAPELLE	SPEEDY	LEU-36	N133	LAPUA	EUBER-66	205M
ALLIE EUBER	6PPC	VIPER	HART	LACHAPELLE	BRUNO	LEU-36	N133-29.8	LAPUA	EUBER-68	205
LEE EUBER	6PPC	FARLEY	KRIEGER	LACHAPELLE	BORDEN	LEU-36	NA	LAPUA	EUBER-68	205
BOB GRIFFIN	6PPC	BAT	KRIEGER	GOODLING	LARSON	LEU-36	N133	LAPUA	EUBER-66	205M
KEN HOPE	6PPC	BORDEN	HART	BORDEN	ROBERETSON	SIGH-36	N133-28.9	LAPUA	EUBER-68	205M
SCOTT MILLER	6PPC	PANDA	HART	LACHAPELLE	SPEEDY	LEU-40	H322-29	LAPUA	EUBER-68	205
TOM SAFFORD	6PPC	PANDA	HART	LACHAPELLE	MCMILLAN	LEU-36	N133-29.5	LAPUA	EUBER-68	205
WYATT FOX	6PPC	PANDA	HART	HAMMONDS	LEE SIX	LEU-36	N133-29	LAPUA	EUBER-66	205
RUSSELL RAINS	6PPC	PANDA	HART	LACHAPELLE	KLUB	SIGH-36	N133-29.2	LAPUA	CHEEKS-68	205
ROBERT BLANCHARD	223	SAVAGE	SAVAGE	SAVAGE	H-S PRECISION	LEU-35	W748-25.2	LAPUA	BERGER-60	WSR



IBS OFFICERS

PRESIDENT
Jim Borden
RR#1 Box 250 BB
Springville PA 18844
Phone (570) 965-2505
FAX (570) 965-2328
email: Jim@Bordenrifles.com

VICE PRESIDENT and
MATCH SCHEDULE CHMN.
Dick Grosbier
10220 Allview Drive
Frederick, MD 21701
Phone (301) 898-5461

2nd VICE PRESIDENT
Gary Long
PO Box 20
Millville, PA 17846
Phone (570) 458-5444
email: longgun@sunlink.net

TREASURER
Bill Gebhardt
101 Allison Street
Lock Haven, PA 17745
Phone (570) 748-6772
email: Bepmachine@aol.com

EXEC. SECRETARY
Jim Goody
768 Brewer Lake Road
Orrington, ME 04474
Phone (207) 825-3987
email: tjgoody@aol.com

RECORDING SECRETARY
Joan Borden
RR 1 Box 250 BB
Springville, PA 18844
Phone (570) 965-2505
FAX (570) 965-2328
email: Joan@Bordenrifles.com

PAST PRESIDENT
Robert White
8 New Jersey Avenue
Lake Hopatcong, NJ 07849
Phone (973) 663-5159
email: shootcnr@optonline.net

IBS EDITOR
Dave Brennan
222 McKee Street
Manchester, CT 06040
Phone (860) 645-8776
FAX (860) 643-8215

IBS WEBMASTER
Dick Grosbier
10220 Allview Drive
Frederick, MD 21701
Phone (301) 898-5461
email: dickgrosbier@yahoo.com

INTERNATIONAL BENCHREST SHOOTERS BENCHREST SCHOOL EAST TAWAS RANGE OF IOSCO SPORTMAN'S CLUB

1600 US HWY 23
EAST TAWAS, MI 48730
JUNE 20-21, 2008
PREPAID REGISTRATION AND
$150.00 TUITION IS REQUIRED

Tuition includes all of the following: One year membership in IBS, One year subscription to Precision Shooting Magazine, Lunch at the range on Saturday and Sunday, Steak Dinner at the range on Saturday evening, Tee-shirt with the logo of the school emblazoned on the chest, Entry in the merchandise draw conducted on Friday evening, Tutoring by some of the finest benchrest shooters in the area, Instruction and practice on Friday evening, all day Saturday, Sunday morning, IBS sanctioned 100 yard score match on Sunday, Friendships made, And camaraderie to be remembered for years.

For more information contact Francis Becigneul at
fbike@wildblue.net
Or send your name, address, phone number, shirt size, and $150.00 check to:

FRANCIS BECIGNEUL
6148 GIBBONS ROAD
JEDDO, MI 48032-3701
810-327-2255

INTERNATIONAL BENCHREST SHOOTERS APPLICATION

NAME _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

COUNTRY _____

****

( ) IBS Membership and PS 1 Year – $50/yr.
( ) Associate Membership – Must live in same household as regular member – no PS – $15/yr.
( ) Junior Membership – 17 and under – no PS – $5/yr.
( ) USA Club Affiliation with 1 Year PS $50/yr.
Foreign membership (includes PS for 1 yr).
( ) Canada $75.00/yr U.S. funds.
( ) Europe $83.00/yr U.S. funds.
( ) Japan, S. America, Mexico $88.00/yr. U.S. funds.
( ) So. Africa, Israel $105.00/yr U.S. funds.
( ) New Zealand $104.00/yr U.S. funds.
( ) Australia $105.00/yr U.S. funds.

MAIL MEMBERSHIPS TO: JOAN BORDEN, RR 1 BOX 250 BB, SPRINGVILLE, PA 18844
Make Checks payable to: **IBS**
CHECKS MUST BE IN U.S. FUNDS OR THE CHECK WILL BE RETURNED

ADVERTISER'S DIRECTORY

A

Anthony's Precision Rifles 16
ASSRA 52

B

B.J. Enterprises 104
Bald Eagle Precision Machine Co. 85
Bart's Custom Bullets 58
BAT Machine Co., Inc. 105
Bear Basin Outfitters 31
Berger Bullets, LLC 46
Big Shooter Products 55
Bruno Shooters Supply 18, 19, 20, 21
Brux Barrels 105
Bull Mountain Rifle Co. 105

C

CCG Firearms 105
Cockrell, James 105
Corbin Mfg & Supply, Inc. 26, 105
Craig Colabaugh Gunsmith, Inc. 105
Creedmoor Sports, Inc. 116
CryoPlus 91

D

D & B Supply 48
Dave Manson Precision Reamers 83
DCG Bullets 104
Dominion of Canada Rifle Assoc. 6
DPMS 63

E

Evolution, USA 72
Eye Blind, LLC 105

F

Flash Ebert 105

G

Gary's Gun Shop 99
GMW / Gemmell's Machine Works 104
Gracey Case Trimmer 57
Gradient Lens Corp. 35
Gré-Tan Rifle/G.T.R. Tooling 9

H

Harrell's Precision 81
Hart Rifle Barrels, Inc. 69
Hart, R. W. & Son, Inc. 59
Haydon's Shooter's Supply 23
Hoehn Sales, Inc. 6
Holland's Shooters Supply, Inc. 33, 78

J

Jard, Inc. 105
Jewell Triggers, Inc. 105
JGS Precision Tool Mfg., LLC 102

K

K & M Services 94
Kelbly's, Inc. 2
Knight's Bullets 66
Kokopelli Products 104

L

Lawton Machine 104
Leupold & Stevens, Inc. 49
Lilja Precision Rifle Barrels, Inc. 47
LS Starrett Co. 41
Lyman Products Corp. 43

M

Midway USA 47
MT Guns 75

N

Neal Johnson's Gunsmithing, Inc. 35
Near Mfg. 53
Newlon Precision 92

O

Optical Services Co. 104
Outdoorsman, Inc. 105

P

Pacific Tool 101
Perry Systems 11
PS Book Offerings 50, 71, 97, 115
PS Publications 12, 65, 73, 87
Precision Shooting Subscription 42
Pro-Shot Products 29
Puff-Lon 55

R

Redding Reloading Equipment 38

S

Schneller Mfg. Inc. 66
Scoplevel 69
Sharp Shoot R Precision 40, 77
Shilen, Inc. 54
Shooter's Choice 45
Shooters' Corner, Inc. 104
Sinclair International, Inc. 37, 39
Single Shot Exchange Magazine 86
Six Enterprises 60
Stevens Accuracy 104
Stiller's Precision Firearms, LLC 62

T

Time Precision, Inc. 104
TM solution 22
TM Stockworks 93
Trading Post 104

V

Vais Arms, Inc. 100
Valdada Enterprises, LLC 44

W

Western Powders, Inc./ Montana Extreme 2
Westwind Rifles, Inc. 104
Williams Firearms 54

New book offering...

NEW EXACT SMALL ARM BALLISTICS

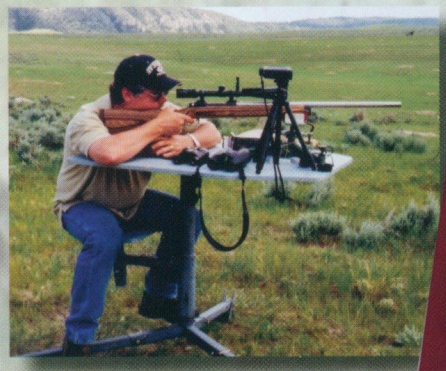
"THE SOURCE BOOK FOR RIFLEMEN"

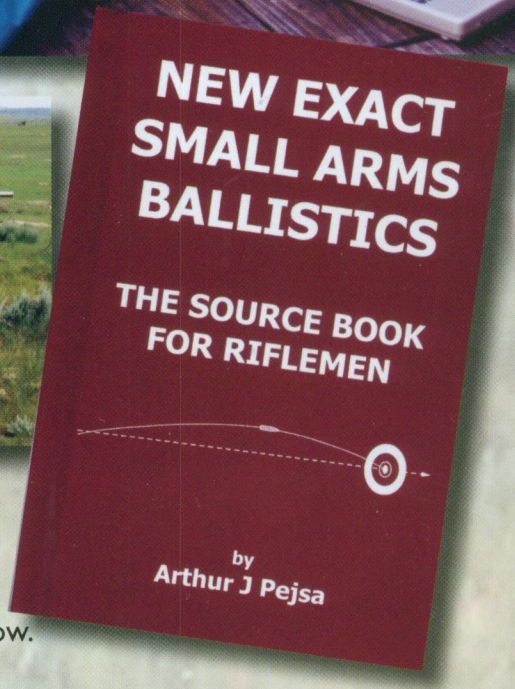
by Arthur J. Pejsa

This new book by Prof. Art Pejsa, often considered the world's foremost small arms ballistics authority, summarizes knowledge gained during half a century of teaching and "doing" ballistics. Gleaned from fifty published articles and two previous books; contains much valuable new information for all shooters from novices to experts. Most important, it presents new, simple but exact formulas and methods for predicting trajectories out to extreme ranges.

Table of contents:

Gravity
Accounting for air drag
The flight path and related elements
Techniques for long range shooting
Drag, retardation and ballistic coefficients
Velocity and energy
Flight time and cross-wind deflection
Ballistics on a hand calculator
Precise prediction using tables
A revolutionary breakthrough
Precise prediction. Modeling the drag curve
Calculating drop D through four V zones
The importance of various error sources
An analysis of projectile stability
Maximum range, height and flight time
Scope cant or tilt errors
Shooting on steep inclines
Disproving ballistic myths
Cartridge efficiency, recoil vs. energy
.22 rimfire ballistics
Interior and terminal ballistics
Summation of ballistic formulas
Appendix: Derivation of formulas
Tables for long range prediction





Hardcover, 162 pages, 5 ½ x 8 ½ size for easy carry in the field. Absolutely a must-have book for the library of any serious long range shooter, regardless of the accuracy discipline. Available and in stock now.

ORDER NOW: at $24.95 plus shipping and handling. Shipping in US is $3.50 for the first book, $5.00 for multiple book orders. Foreign orders (including Canada) will be charged actual shipping costs plus $1.00 handling.
Order from: Precision Shooting, 222 McKee Street, Manchester, CT 06040. Phone (860) 645-8776, fax (860) 643-8215. Visa/ Master Card orders accepted without surcharge. CT residents add 6% sales tax. NY residents add 4% sales tax.

CREEDMOOR SPORTS

"Competitive shooting is one of the best ways to teach juniors the finer points of safety, sportsmanship, discipline, and a deep respect for firearms."

R. Lee Ermey, AKA "The Gunny"
Semper Fi

Catalog 21
$4.00

2008 CATALOG

CALL NOW TO ORDER YOUR COPY! 1-800-273-3366

CREEDMOOR SPORTS, INC. 1405 S. COAST HWY. OCEANSIDE, CA 92054
E-MAIL: shoot@creedmoorsports.com • INTERNET ORDERS: www.creedmoorsports.com • FAX ORDERS: 760-757-5558